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Electro-technology

April 1928

Electrical Manufacturing

Vol. 1 A Gage Publication No. 1

1687
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Vols. 1 and 2. 1928

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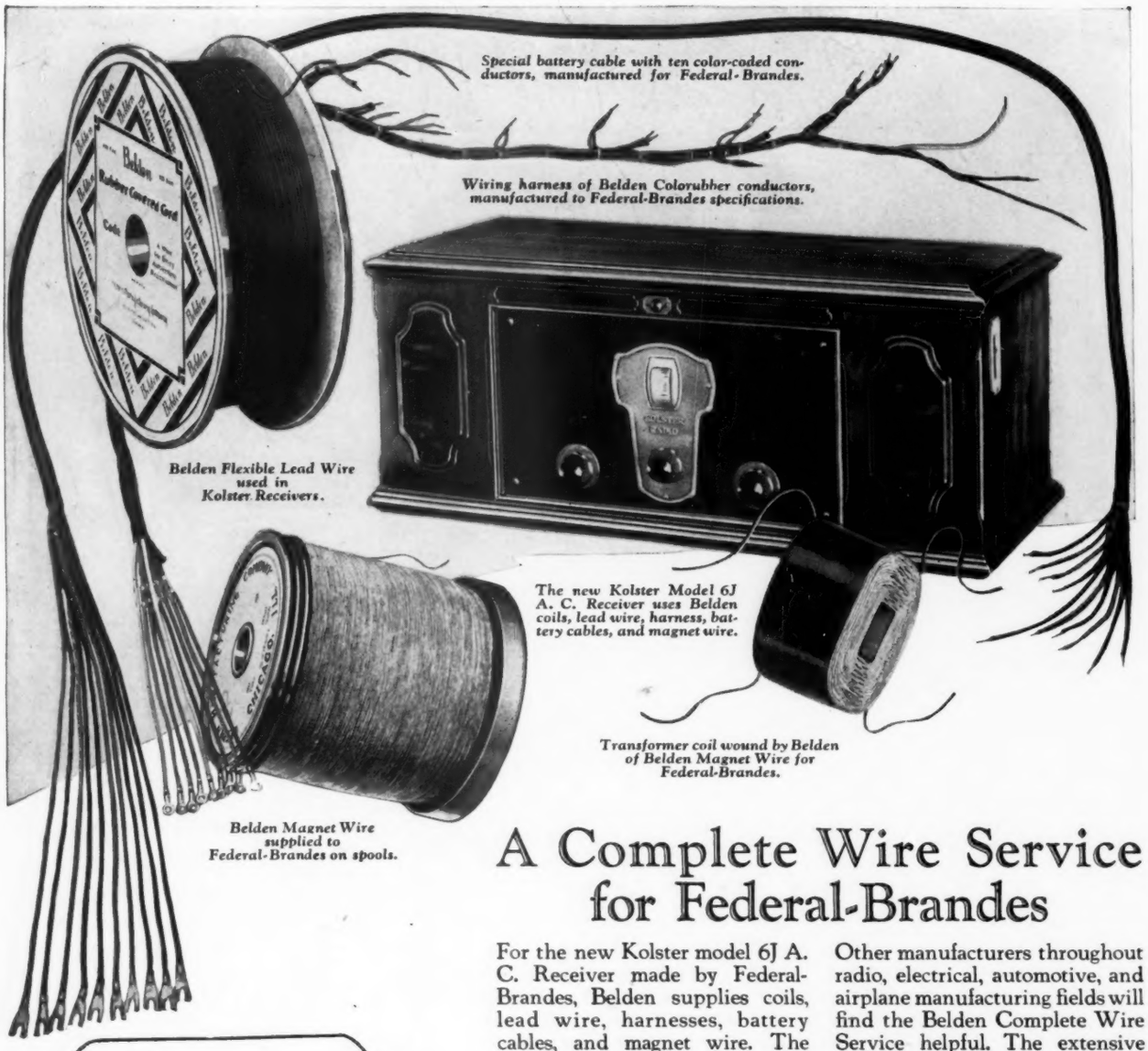
Special battery cable with ten color-coded conductors, manufactured for Federal-Brandes.
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For the new Kolster model 6J A. C. Receiver made by Federal-Brandes, Belden supplies coils, lead wire, harnesses, battery cables, and magnet wire. The complicated harnesses, battery cables and coils are manufactured by Belden accurately to Federal-Brandes specifications.

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Automotive Wires and Cables
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INSTRUCTIONS

Timken-Equipped Electric Motors

ONCE EVERY FEW MONTHS LUBRICATE THE BEARINGS. That is all it takes to preserve the extreme wear-resistance of Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel.

DON'T WASTE LUBRICANT. Timken Bearings permit compact, perfectly closed mountings which keep in grease, keep out foreign matter and insure your product against damage from dripping.

MOUNT MOTOR ANYWHERE. Floor, wall or ceiling positions are all the same to Timken Bearings. They have brought the day of the *thrust-radial* motor! Timken-equipped motors are ready for any job within the motor builder's specifications.

USE WITH ANY TYPE OF DRIVE—DIRECT OR INDIRECT. Type of drive makes no difference to Timken Bearings. They protect against any combinations of thrust and radial load, as well as against friction and speed and shock. That is why they are *"more than anti-friction bearings."*

ABOLISH FREQUENT GAP INSPECTION. Rotors are more accurately centered to begin with, and the closest gap is safely maintained, due to Timken rigidity and the absence of bearing wear. For load area is greater, the motor shaft is shorter, and there is no moving contact on the shaft surfaces!

LET THEM ALONE! You have specified years of consistent, worriless, cost-cutting motor operation when you specify Timken Bearings in every motor you order. You can let your motors alone. Attentionless, consistent, economical operation, and greatly increased durability always result from using Timken Tapered Roller Bearings in *any* industrial equipment—from giant rolling mills to the ultra-precision mounting of machine tool spindles.

FOR FURTHER INFORMATION see the records of thousands of Timken-equipped motors, many of them serving for years where bearing life was previously a matter of months.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

SINGLE ROW TIMKEN BEARING

DOUBLE ROW SELF-CONTAINED TIMKEN BEARING

TIMKEN
Tapered
ROLLER BEARINGS

Put Your Insulating Problems Up To Formica!
INSULATING parts of high and permanent efficiency that will not absorb moisture and swell or warp are available in Formica in any shape or size that is desired.
The largest equipment in the industry and an organization that is specialized on just product make Formica headquarters for insulating parts.
There is complete and varied equipment for punching, sawing, machining, printing in various colors ... and the production of very handsome Wood, Marble, Ivory and special finishes where appearance is an important factor.
Facilities are not only extremely varied, but are maintained in excess of ordinary demand so that all orders can be shipped promptly.
Send your blue prints for quotations on your insulating parts.
THE FORMICA INSULATION COMPANY
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CINCINNATI, OHIO
FORMICA
Made from Anhydrous Bakelite Resins
SHEETS TUBES RODS

Electrical Manufacturing

Production Marketing Administration Servicing

A GAGE PUBLICATION

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Volume 1 APRIL, 1928 Number 1

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Edison Says Our Electrical Development Is Only Begun

MANY minds, working together, produce progress that outruns the imagination of even the most courageous. I have lived to see the street car, the elevator, the electrified railroad, the automobile, the phonograph, the motion picture, the radio, the airplane, and the beginning of television.

Thomas A. Edison

"It may be that the next forty years will not produce inventions of such revolutionary character.—But of one thing I am more positive than I was even forty years ago—our electrical development has only well begun.

"So long as there remains a single task being done by men or women which electricity could do as well, so long will that development be incomplete. What this development will mean in comfort, in leisure, and in opportunity for the larger life of the spirit we have only begun to realize. Great days are ahead of this nation and the world. And electricity will have a great part to play, granted only that it can be unfettered, with full opportunity for the largest possible individual initiative and energy.

—*Thomas E. Edison, in "Aladdin U. S. A."*

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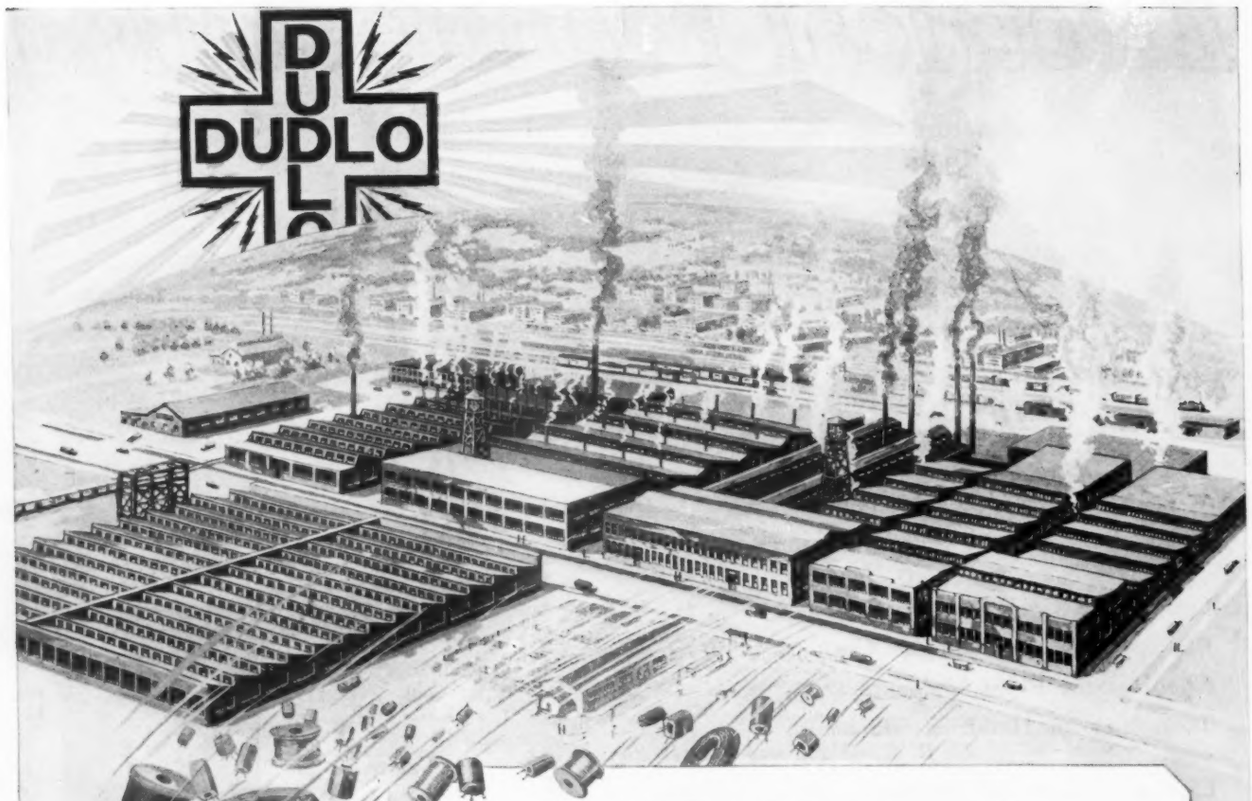


The Magic of Modern Production Methods

is seen at its best in the great plants of Dudlo Manufacturing Company at Fort Wayne, Indiana

In a constant and unending stream, these precision products flow from the miles of special machinery to take their place in thousands of electrical units which are making life more convenient and enjoyable the world over.

Magnet wire in all shapes, sizes and insulations. Bare, Tinned and Braided wires. Coils of every conceivable type for Radio, Ignition, Meters, Transformers, Motors, X-Ray, Violet Ray and every electrical purpose known to modern science.

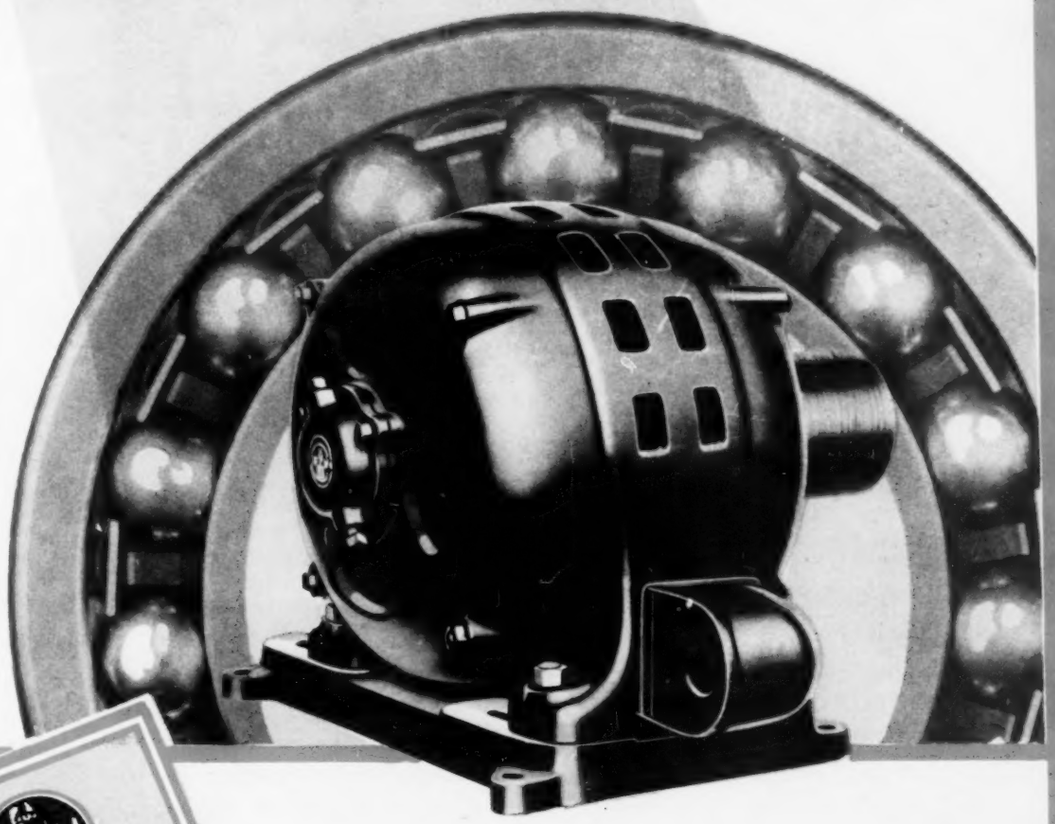
Running 24 hours a day, this plant with its highly trained employees and skilled engineers, is in a position to render an unequalled service to electrical and radio manufacturers anywhere.

DUDLO MANUFACTURING COMPANY, Fort Wayne, Indiana
Division of the General Cable Corporation

DUDLO

The SIGN of a QUALITY product is its MOTOR

Your product, too, is known by the company it keeps. The quality of a motor-driven machine is judged by the quality of the motor included in its equipment. ¶ One part of any machine that *has* to be right is its motor—for the performance of any machine is limited to the performance of its source of power. ¶ Machinery manufacturers have found in Fairbanks-Morse Ball-Bearing Motors that something extra—that additional something which reduces servicing and adds to users satisfaction. ¶ In selecting motors for your product the right type motor is *important.* Fairbanks-Morse engineers will gladly give you their recommendations.



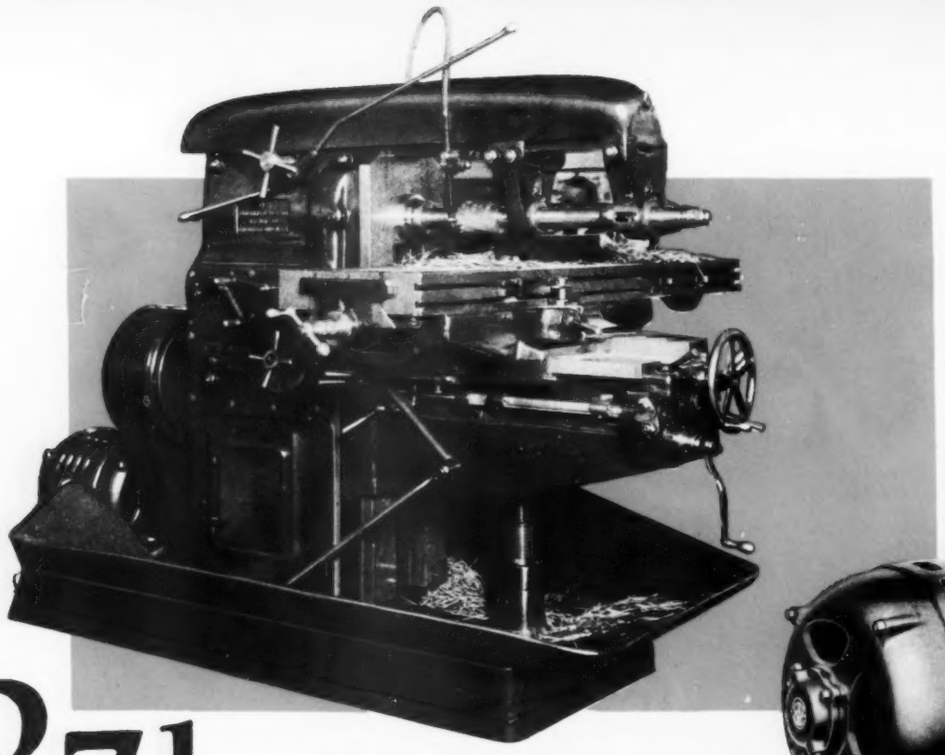
FAIRBANKS-MORSE *Motors*

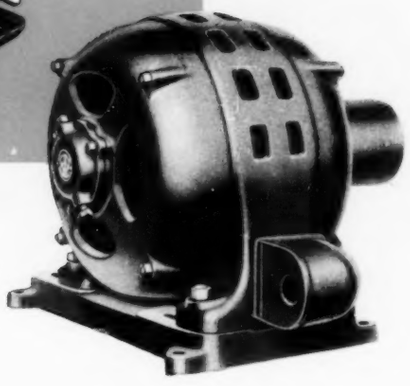
POWER-PUMPING AND WEIGHING EQUIPMENT

FAIRBANKS-MORSE MOTORS

Pioneer Manufacturers of
ball bearing motors

FAIRBANKS-MORSE MOTORS

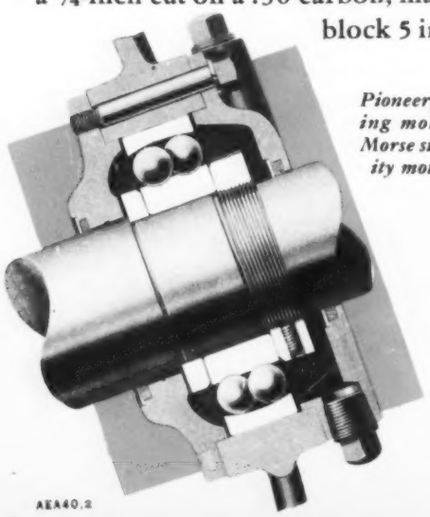




37½ Cubic Inches of .30 carbon *Removed per minute* —that's performance!

ACCORDING to the National Twist Drill & Tool Co., all milling records were smashed by this Cincinnati Milling Machine equipped with their "Parabolic" milling cutter.

During a test at the National Steel Exposition this cutter removed 37½ cubic inches of metal per minute, using a feed of 30 inches per minute on the table and taking a ¼-inch cut on a .30 carbon, machine steel block 5 inches wide.



Pioneers of the ball-bearing motor, Fairbanks-Morse still lead in quality motor construction

It is both natural and right to give full credit to machine and tools in a test of this kind. But in doing this do not forget that both were at the mercy of the motor—in this case, a Fairbanks-Morse *Ball-Bearing* Motor.

In this withering test of mechanical stamina the sturdy frame, short rigid shaft, and ball-bearing construction of the F-M Motor were given an opportunity to demonstrate their true worth. As usual, results proved that it pays to consider not only the machine, but also the motor behind the machine!

Ask your machine tool dealer for facts about F-M Motors.

FAIRBANKS, MORSE & CO., *Chicago*

28 branches throughout the United States at your service

FAIRBANKS-MORSE MOTORS

AEA40.2

Fedrelin

Permanent heat-resisting insulation built to your specification

. . . in moulded or pressed sheets, tubes and rods of laminated paper-fabric or wood impregnated with Carboloid

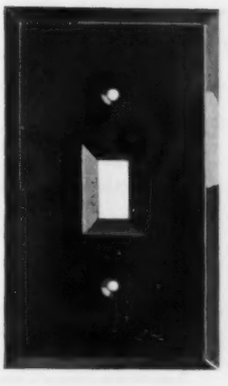
During the course of this series of advertisements many FEDRELIN uses will be treated—any one or a number of these may be the solution of your difficult problems.

FEDRELIN in pressed sheets, can be machined and tooled into practically any shape you may specify.

FEDRELIN can be moulded in any desired form. It is furnished in any thickness either flexible, intermediate, or hard. Readily worked with tools—saw it—drill it—tap it—thread it or punch it. **FEDRELIN** is of high dielectric and mechanical strength—an insulation that does not become brittle with age. It is resistant to oil, grease, acid, solvents, and other liquids.

FEDRELIN requires no aging, immediate production may be expected.

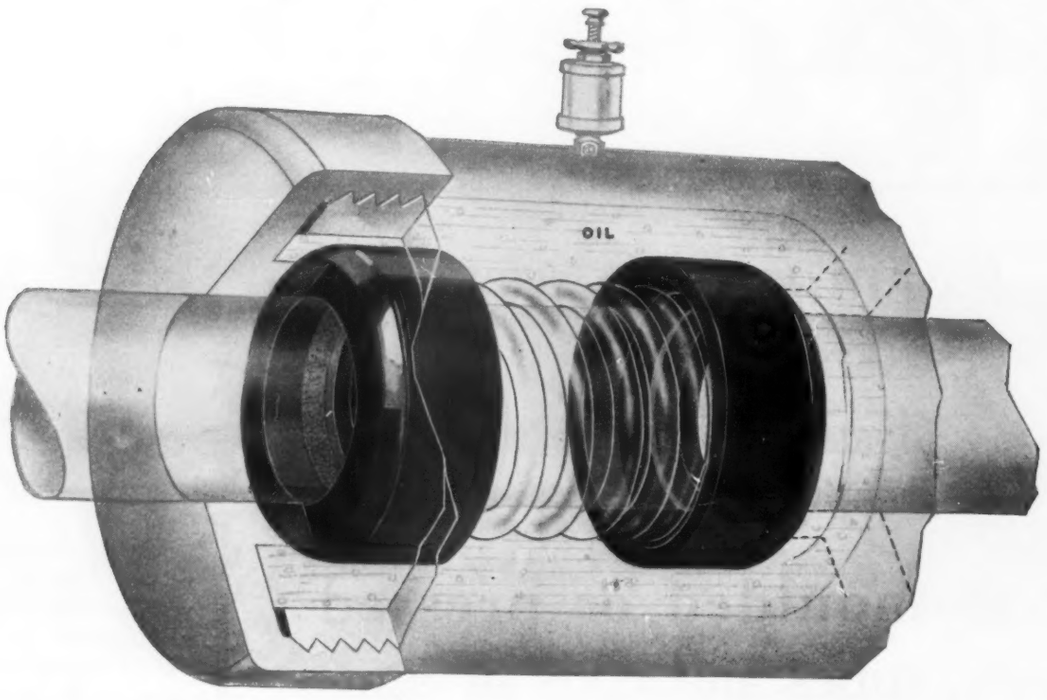
Prompt service and deliveries.



FEDERAL INSULATING CORPORATION

Yonkers, New York

Tell your dealers, "*Our product is equipped with Cooke Seal Rings,*" and watch sales jump!



Manufacturers of electrical equipment who adopted the Cooke Seal Ring solely from an engineering standpoint were surprised when they found it had a tremendous sales appeal. And here's the answer:

Alert dealers everywhere realize that 40% of all service calls are traceable to packing gland difficulties. These service calls consume the dealers' time and money—this expense cuts their net profits deeply. The Cooke Seal Ring does away with the antiquated stuffing box difficulties thereby allowing the dealer a cleaner profit and aiding him in keeping satisfied customers.

Four simple parts comprise the Cooke Seal Ring assembly—the Cooke Seal Ring itself—a friction grip ring—and a compression spring. This simple device reduces packing friction by 90%—reduces motor load, does away with scoring, hot boxes and wear on the shaft. It eliminates "oil throwing" on electric fans and motors, and on washing machines, dishwashers or similar electrically driven devices it prevents oil from leaking into the washing chamber or water from entering the motor. On refrigerating machinery it stops stuffing box trouble and assures a leakless joint which will hold either pressure or vacuum.

Think of how your dealers will receive your product equipped with Cooke Seal Rings in place of the old packing gland. We will be glad to send you full data on prices, sizes and types without obligations. Send the coupon today.

COOKE Seal Ring

46 N. Green Street, Chicago, Illinois, Dept. A

Cooke Seal Ring.
46 North Green St., Chicago, Dept. A.

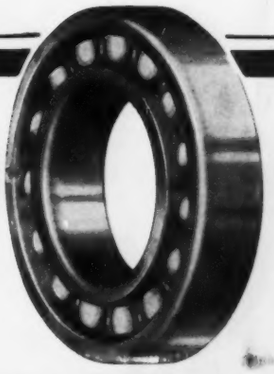
Please send me your FREE booklet without obligation.

Name .....

Address .....

City .....State .....

You can get 'em from the leading motor manufacturers



¶ **FIVE YEARS AGO you could count the manufacturers of ball bearing equipped electric motors for general purpose application on the fingers of one hand.**

¶ **NOW more than FORTY electrical manufacturers supply ball bearings in their general purpose motors as standard or optional equipment.**

¶ **Many dollars and cents saved in maintenance have created the demand to which this progressive step is the answer.**

¶ **Further reasons why electric motors should be equipped with ball bearings are fully outlined in two booklets published by our Engineering Department. "Booklet K" is of interest to designers. "Cutting Your Costs" is of interest to owners, operators and maintenance men. Either or both sent upon request.**

The New Departure Manufacturing Company
BRISTOL, CONNECTICUT
Detroit San Francisco Chicago

Since 1873

For 55 years National Vulcanized Fibre Company has maintained close contact with America's electrical development. In the days when no one was paying much attention to the needs and problems of the electrical pioneers "National" saw the future for better and cheaper insulation and was the first to co-operate with this infant industry. A generation later, when the demand came for a strong, pliable and highly efficient insulator for armatures, National was ready with *Peerless Insulation*. It was the *first fish paper* and has been accepted as standard for armature insulation ever since.

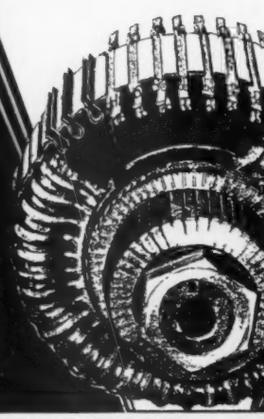
Old Timers Stick to Peerless

PEERLESS INSULATION

Vulcanized Fibre is the only material known that will successfully stand the strain of track insulation — built to withstand compression stress up to 42,000 pounds per square inch.

NATIONAL VULCANIZED FIBRE

"The material with a million uses"



Phenolite is made in six standard grades —each adapted to a specific use, and each of definite character and unvarying quality, made in accordance with our own scientifically exact formulæ.

PHENOLITE Laminated BAKELITE

NATIONAL VULCANIZED FIBRE CO., Wilmington, Del., U. S. A.

Makers of laminated insulation since 1873

Offices in Principal Cities

APR 18 1928
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Electrical Manufacturing

Production Marketing Administration Servicing

A GAGE PUBLICATION

Volume 1 APRIL - 1928 Number 1

What About Your "Key Men"?

By STANLEY A. DENNIS

Editor, ELECTRICAL MANUFACTURING

NO matter whether you boss the men in the plant, or manage the sales department, or run the office, or own the business, key men are as essential to you as money or buildings or machinery or materials or jobbers or contractors or dealers. For key men are the fellows all along the line who can thrust aside obstacles which baffle lesser men. They are the men who hold the keys that unlock the doors to greater success for your business today—and tomorrow.

In the plant, they are the picked fellows here and there, perhaps in greasy overalls, who can take over your job at a moment's notice and keep machines running, materials moving, and orders loading from the shipping platform.

In the sales department, they are the two or three top-notchers who know best how to sell your goods, whose sales steadily average more than their quotas, who can bring up the total volume of business when other salesmen fall down, who know the marketing problems of the business and who could sit down at your desk and keep orders coming in.

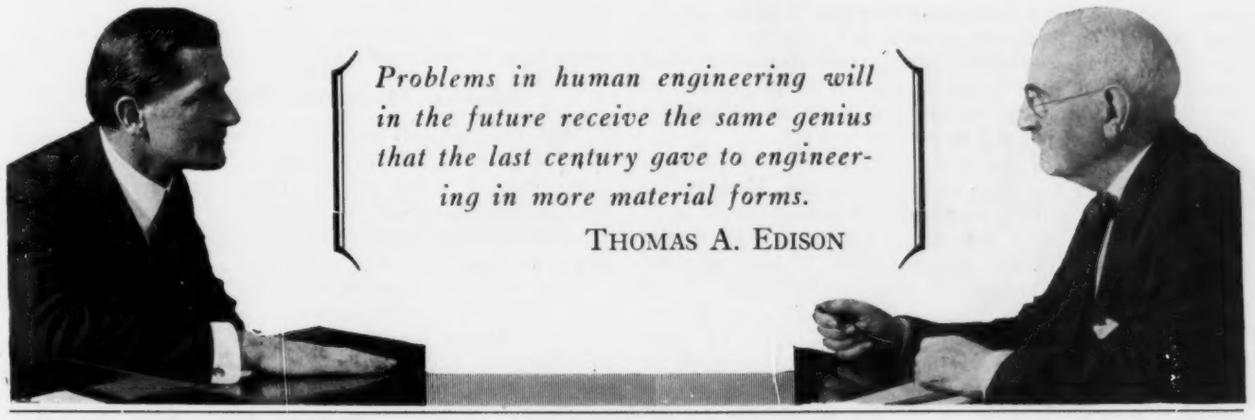
In the office, they are the few executives who can and will tackle unafraid the larger problems of finance, credit, collections, trade relationships, company policies, and administrative control. They are the men who can keep your production and marketing coordinating at a worthwhile profit.

If you are the owner, your key men are the few picked men who will "carry on," if for a while you must unload on them the burden that you have carried through the years. They are the men who are not to be daunted by the kind of difficulties you have mastered; they are the men to whom you would entrust the big problems of your business and whose decisions would command your respect and approval.

A business has outgrown the one-man stage when the owner finds it impossible to handle any longer the mass of executive details that pile up on his desk. He must then turn to his key men and delegate to them both authority and responsibility. Fortunate is that business in which men have been trained for such an hour.

Without such key men in every department, from factory gate to president's office, you are in a bad way. Unless you find and keep your key men, you may as well prepare to hang the black crepe and the white lilies on the factory doorbell. But with them, you may snap your fingers at the little devils of misfortune that prod your business daily, and forge ahead through obstacles or over them to a measure of success such as you have never yet known.

Who are your key men? Can you name them? Are they like fine steel, well-tempered to the tasks ahead of them? Do they ring true? Have you opened up a future for them in planning your own tomorrow? Have you met them face to face, eye to eye, and given them a vision of the opportunity and reward that go hand in hand with authority and responsibility well discharged? It's up to you. What about *your* key men?



Problems in human engineering will in the future receive the same genius that the last century gave to engineering in more material forms.

THOMAS A. EDISON

Competition and the

If he is pitted against a big competitor, he is usually matching his ability and his wits against only one man or a single department, and his success depends upon his efficient methods

WHAT does the future hold for the small manufacturer? Will expanding corporations and multiplied mergers force his numbers down to a minimum, or will he hold his own against those influences? What does the fact that about forty per cent of the corporations doing business in the United States reported no net incomes in 1925 mean to the small manufacturer? Is he suffering from a period of profitless prosperity"? Can he pull himself up by his own boot-straps and himself take some or all of the "fit" out of that profitless prosperity?

George E. Roberts, vice-president of The National City Bank, New York City, quotes figures to show that, while business declined in 1927, there is really no justification for hard-times talk. A total of 709 leading industrial corporations reported for 1927 a profit level 7.9 per cent below that of 1926, but slightly above that of 1925, up to that time considered a very good business year. Twenty-one manufacturers of electrical equipment reported a profit decrease in 1927 of 0.5 per cent from 1926, but an increase of 11.1 per cent over 1925. Excluding General Motors Corporation, the 1926-1927 profit change was —10.5 per cent, and the 1925-1927 profit change was —4.1 for the 708 corporations.

"These figures," said Mr. Roberts, "are by no means bad. Excluding the heavy losses sustained by the oil companies, aggregate earnings in 1927 were approximately equal to those of 1926 and 8.5 per cent above those of 1925.

THE electrical manufacturing industry is part and parcel of American business as a whole. What affects American business affects the electrical manufacturer, and vice versa. Each month ELECTRICAL MANUFACTURING will carry an interview with, or a special article by, a leader of industry on matters of importance to every electrical manufacturer. He may or may not be a member of the electrical manufacturing industry, but his word will carry a weight which cannot be disregarded. The accompanying interview, first of this series, expresses the convictions of George E. Roberts, vice-president of The National City Bank, whose monthly letter on economic conditions is one of the indispensable authoritative barometers of industrial and commercial conditions in this country.

STANLEY A. DENNIS
Editor

Failures Mostly in New Concerns

"AS for the corporations which reported no net incomes in 1925, we should not forget that it has always been true that a large proportion of the people who go into business on their own account fail to achieve success. Ever since I can remember, figures have been floating about to the effect that 90 or 95 per cent of all the people who go into business fail sooner or later. I doubt the authenticity of such statistics, but the proportion is large.

"I believe most of the failures are suffered by concerns which never had any right to expect success. Many people go into business without adequate qualifications or preparations. They start on a shoe-string, hoping to build up the business out of its profits. Sometimes that is done, provided the man knows his business thoroughly. But many of the ventures are ill-advised. Many of the managers are without experience or qualifications for their jobs. Many of these concerns have no reserve resources and thus succumb to unfavorable circumstances. Some succeed more by reason of good fortune than adequate preparations. And the fact that the failures are suffered mostly by small concerns indicates that they were new and never got out of the infant stage.

"There is, however, a sprinkling of old concerns which have been well established and profitable, but which have died of dry rot. Competition is keen, and it is not easy to build up a new business or even to maintain an old one unless the economic factors are right and the management is intelligent and keeps up-to-date."

Mr. Roberts paused and reached for a folder. He impresses one as the kind of an executive who always has at his finger-tips an adequate illustration or proof for every conviction he states.

"Here is a letter which bears out my point that it is necessary for every business to keep up-to-date," he said. "The letter comes from E. F. Du Brul, general manager of the National Machine Tool Builders' Association. I assume it applies to all manufacturing industries including the electrical. Please read it."

"I note that your March Bulletin," Mr. DuBrul wrote, "commented on the Pennsylvania Railroad report and stated that better machinery and shop tools mean quicker shop work and more active mileage. The recent studies of the National Industrial Conference Board indicate that, on the whole, American industry has developed a tremendous amount of production efficiency in the last few years. Of course, some of this is due to the installation of new machinery, but a great part is due to improvement in management methods. There is a great increase in output that has been gained from even obsolete types of machines. This is not to be wondered at, in view of the findings of the committee appointed by Mr. Hoover in 1921, when as president of the American Engineering Council, he initiated the study of wastes in industry.

Modern Machinery Pays for Itself

"NOW, without detracting in the least from the economies in production gained by the new machines recently installed, I feel safe in saying that there is so much obsolete machinery used in production of all sorts that enormous potential gains are still possible from the replacement of a great deal more such machinery.

"It is somewhat amusing to the builders of machinery to read about how very progressive American manufacturers are in scrapping obsolete equipment. It is true that our manufacturers are more progressive than those of other countries in this respect. But it is likewise true that the pos-

Small Manufacturer

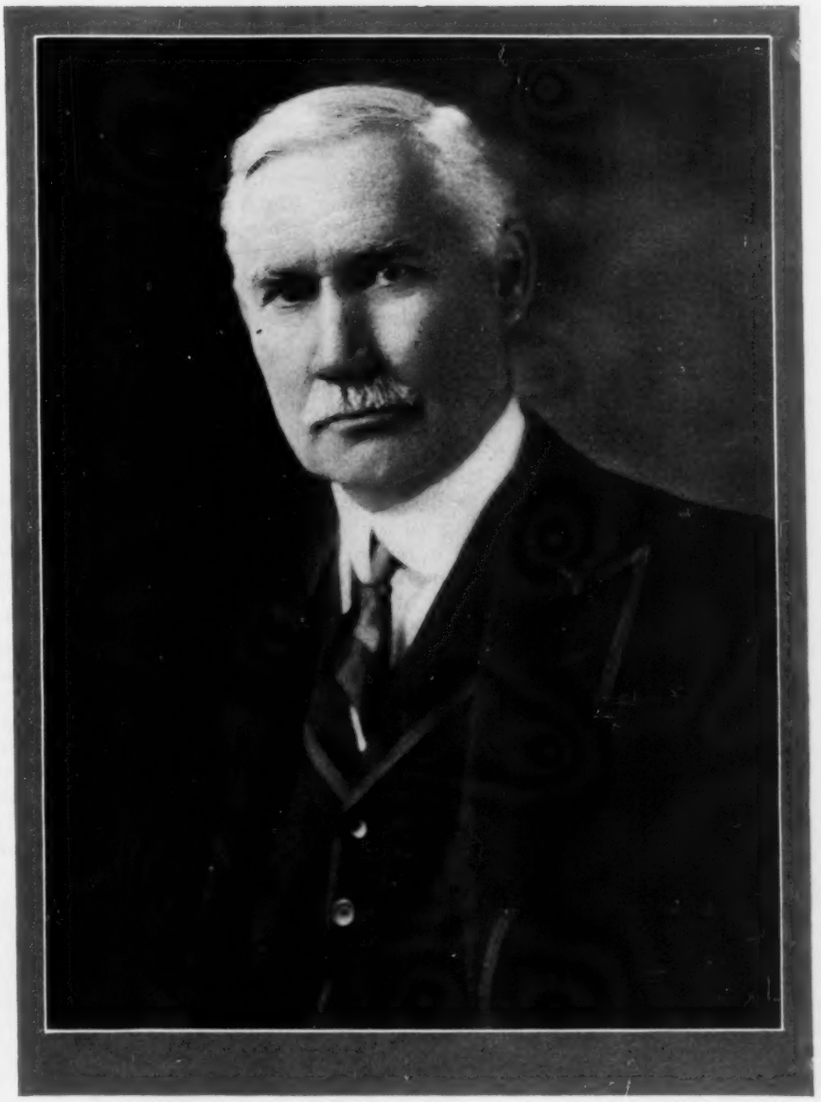
An interview with

GEORGE E. ROBERTS

Vice-President, The National City Bank, New York

By LESLIE H. ALLEN

Managing Editor, Electrical Manufacturing



THE handy-size organization, all within the survey of the master spirit, is the most efficient one. Foremen and superintendents cannot take the place of the owner-boss.

GEORGE E. ROBERTS

sibilities of such progress have not come anywhere near realization in fact.

"Many machine tools have been designed in recent years that are so productive and so low priced that they pay for themselves frequently three to four times a year. Many more pay for themselves in every year or two. One would think that even a 50 per cent return ought to lead men to grab the chance of making such an investment. But the cold fact is that many companies which have the money available and could easily take advantage of these opportunities are by no means eager to do so.

"Companies dominated by sales executives are not particularly keen on cutting down the cost of production and earning bigger dividends in that fashion. Their trend of thought runs more to trying to sell as many goods as a factory can make, even though the factory is over-equipped with obsolete machinery and is therefore showing excessive costs of production.

"The salesman type of manager, and, after all, he does predominate in American industry, is much more inclined to listen to the story of an advertising solicitor working for a big appropriation than he is to listen to the sales engineer of the equipment industry who is trying to reduce his costs.

"In our own industry, I know that very few establishments are completely equipped with up-to-date machinery. We have many small companies that might be consolidated to advantage, pooling their talents and resources, and pooling their business so that the total production would be made in larger, better organized shops. But we cannot get these men to even think about giving up their precious individualities and working for a larger corporation that would make more money on the capital these men now have.

"I suppose that these men may be collecting a personal psychic income of satisfaction in their supposed independence, but certainly they are not collecting the profit income for themselves and their other stockholders, as capitalists and enterprisers.

"What is so common in our own industry is by no means uncommon in many others. One of the reasons why there is so much obsolete machinery is that the managerial function as distinguished from the mechanical function is not as well performed as it could be, and therefore these relatively small companies have not earned the necessary funds with which to replace this obsolete machinery.

"Just as production management has increased output per man in the last few years, in many cases without any change in equipment, it seems to me that the time has come when business executives ought to think of necessary and profitable machinery, in order to increase the returns per dollar of the present rate of the plant investment necessary to carry on

business efficiently in our various manufacturing lines."

Mr. Roberts believed that Mr. DeBrul's letter had touched upon several points that were pertinent to the subject of the interview. He emphasized particularly that small companies suffer from over-equipment with obsolete machinery because the managerial function as distinguished from the mechanical function is not so well performed in small plants as it could be. What Mr. DeBrul wrote about the advisability of consolidations among small companies prompted the request that Mr. Roberts discuss the question of mergers.

"It is true that census returns show a strong tendency toward concentration," he said, "particularly in industries in which capital investment is an important factor. This has been a natural development ever since power-driven machinery began to take the place of hand tools. The least concentration of production existed in the time before the use of power in production and transportation, when every community was very largely self-sustaining.

Some Causes Behind Mergers

"THE cheapening of transportation obviously has been a great factor in the concentration of manufacturing industries, as it widens the field of distribution for any industry located with reference to raw materials and the market for products. The great market affords the opportunity for mass production, which justifies large investment and tends to cheaper production. Furthermore, the increased volume of business justifies national advertising on a scale impossible on a small volume of business, and equips an organization for wide distribution which would otherwise be impossible. Finally, such an investment and scale of operation justify the employment of many kinds of expert services, such as are rendered by scientists and specialists in various lines.

"These are real advantages for a large corporation doing a country-wide business. They should be recognized. It is foolish to enter any field at a known disadvantage, but there are plenty of opportunities under other conditions.

"Many of the consolidations are for the integration of industries that are naturally related, as where the product of one industry is the raw material of another. Spinning and weaving are different branches of the textile industry, now often included in the operations of one corporation. The manufacture of pig iron is carried on independently, but the larger corporations in the steel industry make their own pig iron. Some of the big shoe companies produce their own leather. Probably there are some economies in these 'vertical' consolidations, if they save transportation costs and selling expenses, but they are not always advantageous. The idea of eliminating the profit on the several processes has little or nothing in it, for every process for which capital is invested should produce a profit. The chief advantage of such integration is in having certain supplies of material for the finishing industry at a calculable cost. It is possible that an independent producer may manufacture parts or supplies more efficiently than a subsidiary company.

Raw Materials and Costs

"SO far as the cost of raw materials is concerned, large corporations have little advantage over smaller ones. The principal raw materials such as cotton, wool, copper, leather, coal, pig iron, bar iron and the standard sizes and shapes of steel, copper, leather, coal, etc., are sold at about the same prices to everybody. Labor costs are as much to the large companies as to the small, and that is also true of power, light, transportation and the great run of operating expenses.

"The small manufacturer should also remember that the size of big companies is a disadvantage unless it is fully employed. It involves many overhead charges which cannot be cut readily when business is slack. Furthermore, a big organization almost inevitably accumulates deadwood and has more or less of lost motion. Without alert management the economies are easily offset by wastes. The handy-size organization, all within the survey of the master spirit, is the most efficient one. Foremen and superintendents cannot take the place of the owner-boss.

"The industries are changing constantly by the development of new ideas and there is always a place for a man with a new idea. No big organization can hold its place without offering incentives to young men of originality and ambition which approach the incentives afforded by independent proprietorship. Such young men must have opportunities to express their ideas, to exercise the qualities of leadership which they possess and to win the rewards of success, both in money and recognition, or they will build up businesses of their own. Carnegie knew how to utilize them, and so do all the big organizations. The fact that the big organizations offer extraordinary salaries and profit sharing rewards to capable men shows the value they put upon the personal element in their business.

"Examples may be named in every line of manufacturing of companies which have come up to importance from small beginnings in the last 25 years and even in the last ten, under the shadow of well established competitors. No one would encourage the organization of a new company to make automobiles like all the rest, but there is not an automobile company which is not buying parts largely from independent manufacturers who have demonstrated their ability to make them as cheaply or more cheaply than the big company can supply itself. The steel industry is preeminently one for large capital, but there are numerous examples of prosperous small companies in branches of the steel industry.

Where Small Capital Is Efficient

"THE big industries produce staple goods of certain uniform characteristics in mass volume and the more cheaply they can make such goods the more money the public will have to spend for other things. The best field for the man of small capital is in specialties, goods which have a distinctive appeal to the market, or in the production of supplies for the big industries by economies in production.

"Success for a small business depends upon the man behind it. If he is pitted against a big competitor it is usually against only one man or a single department. He thinks of his competitor as a great corporation with tremendous power, whereas he is really fighting a battle of wits and ability with only a small section of that corporation. He is really pitted against subordinates. If he really has the qualities and the ability to carry on a successful independent business he can compete to good advantage against the competition of the subordinate departments of big corporations. If he does not possess those qualities he ought to be working for a salary.

He Must Know His Costs

"HE must offer something of merit. He must study his problem, run his business on business principles, know his costs, know how to put his goods on the market, how to manage his factory, how to command the support of his banker and be master of the other details which are necessary to success everywhere."

Mr. Roberts stressed the size of large corporations as conducive to an organization and system of doing business which may become cumbersome. Some of the big corporations, he believes, are altogether too big to be very alert competitors against the small manufacturer who is producing something which fills a need and who is producing it efficiently and along thoroughly sound business lines.

And again Mr. Roberts stressed the point that the small manufacturer is actually competing, not with the large corporation as a whole, but rather with one or a few individuals who are subordinates in that corporation. Not infrequently the small manufacturer who is well equipped to carry on such competition is the winner when the law of "the survival of the fittest" has worked out.

If I Manufactured Machines–

I Would *Choose* the *Controller Early*

Too many manufacturers of motor-driven machinery fail to pick out controllers with the proper care at the time of designing their units

By G. O. WILMS
Chief Engineer
Allen-Bradley Company

WHEN I went to Europe not long ago, a number of our customers who do a considerable foreign business asked me to drop in at some of their outlets on the Continent. Fortunately I was able to do this in several instances, for I found accentuated there a condition that exists here too, although with less serious results.

Here is what was happening. American machine manufacturers were sending their products over there—products designed for motor drive—without motors or controllers. The idea was that these elements could easily be supplied at destination. But right there the trouble began. In the first place, motor ratings are frequently different over there and this often led to mismating machine and its driving motor. And there are a dozen similar difficulties.

A machine and its driving motor and controls are too intimately tied together to risk the proper functioning of the whole installation by leaving the determination of the driving motor to a hit-or-miss choice. I am sure it would never occur to you to ship watches out minus balance wheels, with the idea that the customer would supply his own.

The fact is that less and less are machine manufacturers risking their reputation as makers of a good product by leaving the choice of motor and control to the whims of the buyer. And that is true of both foreign and domestic sales. The tendency is strongly toward supplying the machine complete, all ready to set up and operate.

If the machine manufacturer does not interest himself in supplying the correct control, but leaves it to the dealer or user to supply, he is not thereby escaping any responsibility. For the nameplate says that he made the machine and it is to him that the service calls come when anything goes wrong. Poor functioning is bound to reflect directly upon him.

I am fully cognizant of the fact that this often means a stocking of motors and controls in some variety to meet all classes of power source demands, but as far as controls are concerned this is not the large factor that it seems at first glance, for most well designed controls may be adapted to most conditions by a minimum of adjustment or easy replacement of parts.

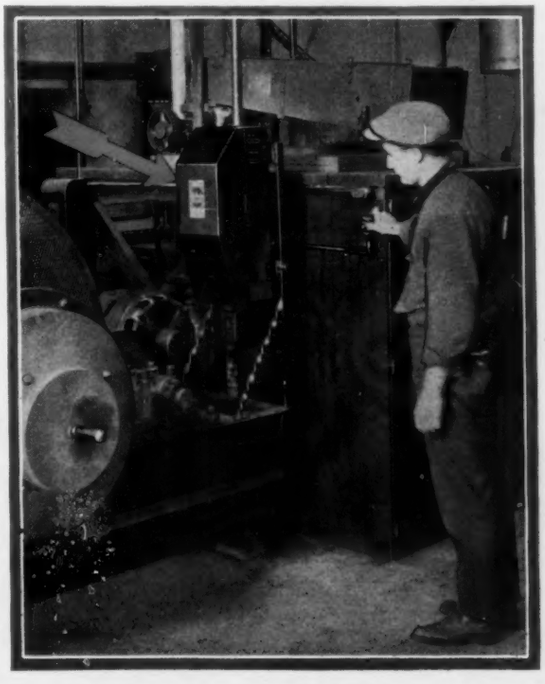
So, if I were a machine manufacturer I would, if it were at all possible, make this plank number one in my platform. Power control, good or bad has the power to make or break a product. I would not dare take the risk of leaving this all important choice to others who must necessarily, in the very nature of things, know less of the demands of the particular case.

Plank number two in my "what-I-would-do" platform would be an insistence that thought be given to the motor and its control 'way back near the beginning of the machine's design rather than, as so often happens, after the design job is practically finished. And why? Let me cite just one of many examples that come to mind.

Not long ago the chief engineer and the head designer of a concern which is a good customer of ours paid us a visit. It seems that a whole year had been spent in designing a fairly large machine and they had just got around to considering for the first time the matter of motor control. Where to put it was then the question, and not an easy thing to decide now that the design was otherwise complete. One of two alternatives presented itself. Either the design had to be altered materially or a special and hence more expensive control had to be designed to fit the conditions.

So many times people come to us and spread out a set of blueprints. They point to the machine pedestal and say, "Now, here is where the control has to go." It would not be so bad if they were only blueprints, but frequently we find that back in the customer's plant are castings actually made. If we had been consulted early in the design, it would have been no trick at all to make the controller space just an inch wider, let us say. Then a standard controller would have fitted in beautifully. But as it is a special has to be made.

Still another case, having similar earmarks, concerns a firm making a line of dough mixers. Because the ingredients at the start are rather thin, the speed to begin with has to be slow or the materials will splash out. This means that more elaborate motor control is required than would otherwise be necessary. The space allotted to the control is, in the first place, not at all "get-at-able," and, in the second, not large enough to accommodate standard equipment. The only "way out" was to design special con-



The illustration shows an automatic controller with push button for operating a rather large motor driven machine. This clearly demonstrates the simplicity of this type of operation control

trols—an entirely needless expense. In fact it is directly opposite to the present wise trend toward simplification.

Since these are almost everyday occurrences with us, is it any wonder that I put as a prominent plank in a "what-I-would-do" platform, "Get the advice of the controller and motor manufacturer, and get it early in the design period"?

Perhaps a feeling on the part of the designer that he must keep his activities quiet and under cover fosters a reluctance to discuss problems with the outside control engineer. But, after all, that point of view is rapidly passing. It leads to more harm than good. And besides, reputable concerns are not peddling design ideas from one customer to another. That would be ruinous practice, and every intelligent engineer knows it and is governed accordingly.

Analyze Motor Requirements

ANOTHER thing I would do early in the design, if I were manufacturing a machine to be motor driven, is to analyze carefully my motor requirements. Whether or not you are planning on using a motor that you can throw across the line in starting will make a big difference, in most cases, with the design of the machine itself. Having made the decision either one way or the other, it is comparatively easy to make your design fit the conditions, but you cannot reverse the order and exercise free choice in the motor and its controls later on.

For example, if you proportion your chain drive a little bit differently, if you put in a rawhide pinion here or a flexible coupling there, you may be able to utilize a standard squirrel cage motor and throw it across the line in starting. But design your machine without this in mind and you are up against special starting precautions later on. There is no escaping this.

Simplicity Means Efficiency

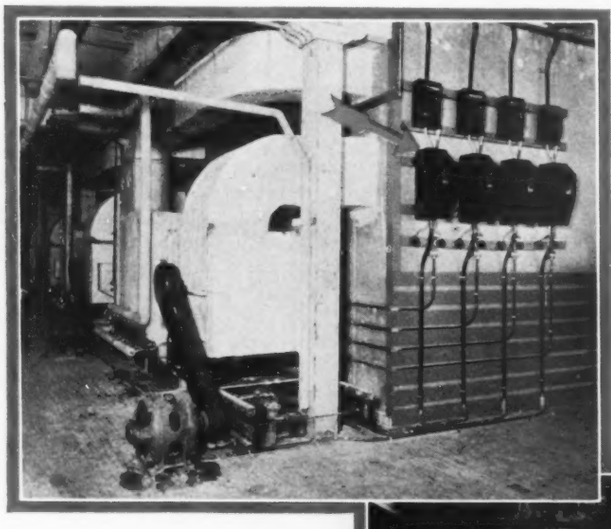
SIMPLICITY is the order of the day, but you cannot get it as regards motor drive and control if you leave these as eleventh hour considerations in a product's design. As I have already said—but it is important enough to repeat and repeat often—the machine tool, its driving motor and its control must work together correctly. You just cannot assemble any old combination and expect lasting satisfaction from customers.

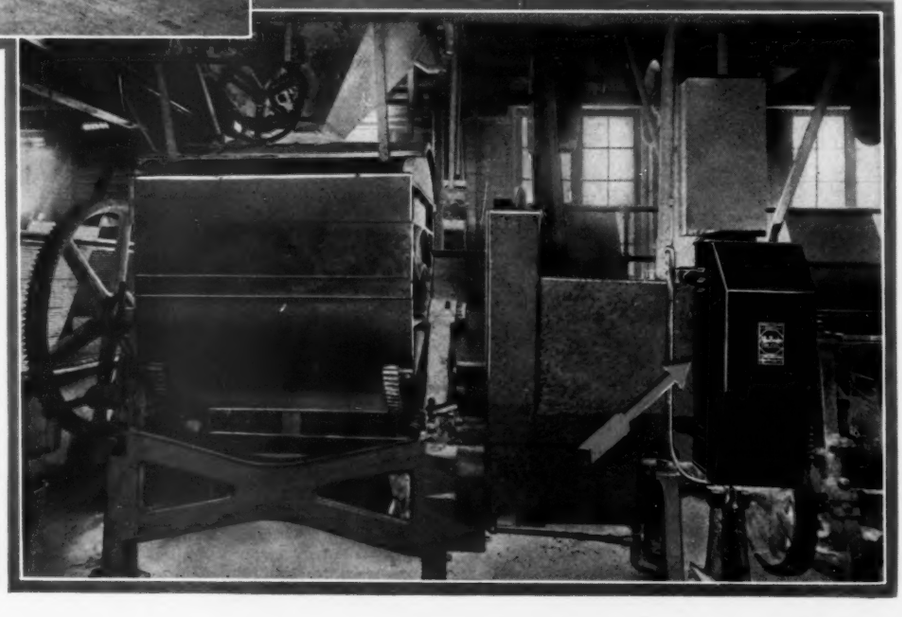
I think too, if I were making machine tools of any sort whatsoever, I would look well into the practice of designers of special machinery such as woodworking machines for example, where there is a tendency to use several motors on the same machine, a separate one for each motion or group of motions. This often eliminates considerable power transmission equipment in the shape of belts, gears, chains and so on with the result that, in the end, you may simplify the whole thing rather than complicate it, as may seem to be the case at first glance.

Automatic Control Usual

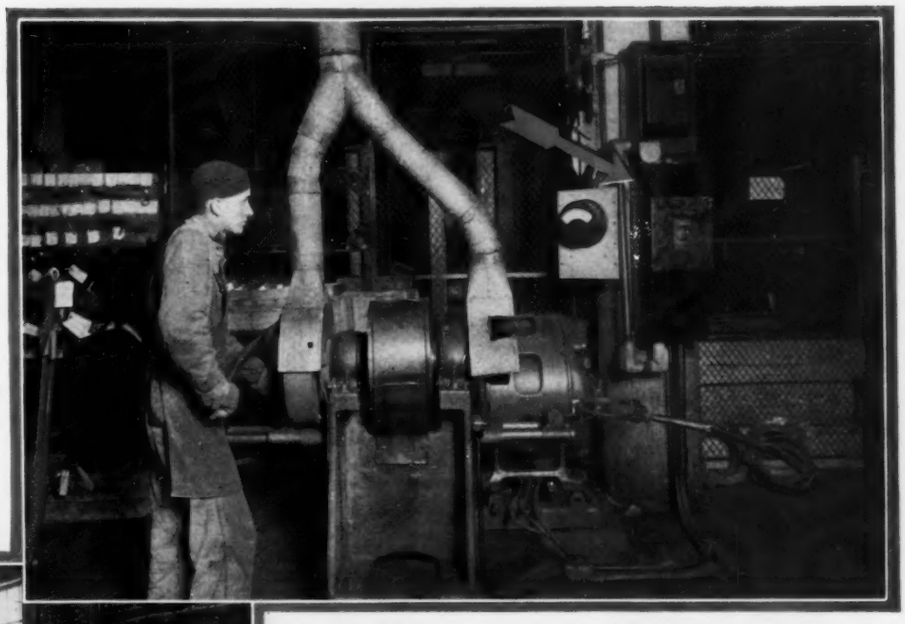
THEN there is the question of automatic versus manual control of the driving motor. Did it ever occur to you that the present generation has grown up to take the push button as a matter of course? When, years ago, George Eastman coined the phrase for his kodaks, "You press the button and we do the rest", there was a novelty to it that made this almost a byword of the nation. Now, however, it is commonplace. It is the most natural thing in the world for even an illiterate workman to push a button and expect results. He holds the push button in no awe whatsoever, but give him a lever to be worked in a certain sequence and troubles are much more likely to ensue.

Somehow the fear complex is more largely present where a lever is to be manipulated than where a button has to be pushed, and particularly is that true where women employees are concerned. If there were any other possible way out of it, I would not trust women workers with lever controls. Here is a homely example of the way the lever versus push button thing works out. I believe it is sufficiently typical to warrant mentioning here. During a recent

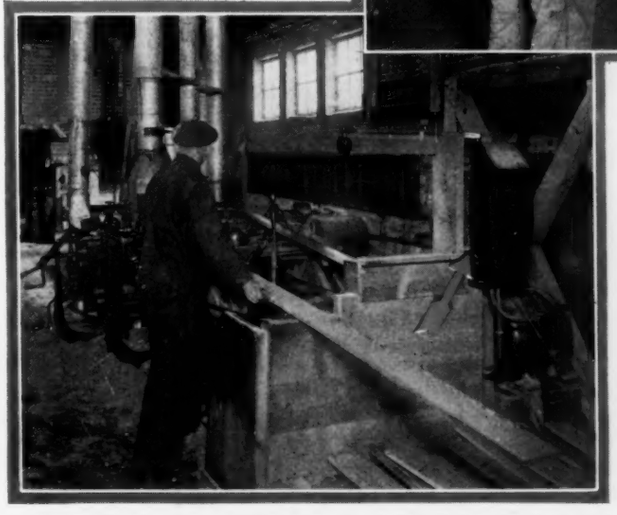




The illustration above shows four 15 hp. automatic starters which operate the dry kiln motors seen in the background. To the right is demonstrated the use of a controller on a dough mixing machine. In this case the controller has been allowed for in the construction of the unit. This is a matter that is often overlooked when deciding on the design



To the right is an automatic controller operating a 50 hp. motor which drives a machine for burning-in brake shoes. Below is an illustration of the use of a controller on the motor of a planer. In both cases the work of employees operating the machine is made comparatively easy because of the automatic feature of the controller in these installations



weekend I was repairing an electric socket in my home. Upon completion of the job I asked my fourteen year old son, who was in the basement at the time, to throw in the switch at the main inlet box. Presumably he did, but I got no light.

It developed that he had been afraid to push it in far enough, and contact was not made. Had I asked him to push a button there is no doubt it would have been done with plenty of assurance. And so were I manufacturing a motor driven machine I would consider push button control as considerably superior, other things being equal.

Automatic Control Is Reliable

WERE I writing this several years ago I should probably have had to defend rather vigorously the reliability of automatic control. For there was then a feeling that automatic devices were complicated—and that was synonymous in those days with lack of reliability.

It was not so long ago that Ford placed a phonograph under the hood of one of his cars at an auto show—a phonograph that kept repeating, "It takes you there and gets you back." It made quite a hit at the time. Today, however, it would be quite flat and pointless. For that is what you expect any automobile to do for you today. It is a matter of course. So it is with automatic motor controls. A minimum number of years of almost absolutely certain service are built into them, just as a definite number of miles of service is built into a reputable automobile. With reasonable, and often even without reasonable care, a given measure of service is almost certain.

A well made motor control, for example of the lighter type, has a million operations definitely and surely built into it. The fear of lack of reliability of automatic motor control equipment has entirely passed, and rightly so. And it is not a question of opinion. It is a matter of experience.

Good Controls Save Money

JUST to test out what it means in dollars and cents to put reliance in motor controls, I had a count made recently of the controls in use on our own machines. Now, we have not what would rank as a large plant, and yet I found that if we should give a thorough inspection to each of the controls in service in our plant once a week it would take one man full time. Fortunately we do not have to do this, nor does any other manufacturer who uses modern well designed, well adapted and well built control equipment. The aggregate savings the country over are enormous.

Nor, were I a machine manufacturer, would I buy motor control equipment on price alone. Far too much is at stake. For, where production equipment is involved, it is not the particular machine itself that is alone affected. If it were, it would be bad enough for me as the maker of that machine to have it go wrong, but the evil would be accentuated by the fact that a whole chain of production is upset temporarily, throwing whole schedules out of whack and many workmen out of useful employment.

Knowing what I do about motor controls—the advantages of well designed ones and the evils of poorly adapted installations—I would insist above all things, if I manufactured motor driven machinery, that the motor be well adapted to the machine and the control to the motor and the machine.

Thus, in summing up, one important point to keep in mind is to go into controller specifications as early as the machine itself is being designed. In this way, the structure of the unit will be such that a standard sized controller will fit it. The mechanics of the controller should be planned to suit not only the motor drive but also the machine. It is only by successful unification of these elements that the unit will give satisfaction. Special attention should be given to the practice of users of special machinery—such as woodworking machines, on which there are several motors on the same machine. In such cases the whole unit may be simplified. Automatic control of the push button type is advisable.

BUYING POLICIES *that* Affect Unit Production Costs

BY LEON I. THOMAS
Electrical Engineer

Insurance against failure of supply, placing orders with small concerns and other policies influencing profits

THE climax to weeks of sales effort came with the receipt of a letter reading something like this: "We will give you our order for one-half of our season's needs provided"—listen to the proviso—"provided you will manufacture a duplicate set of dies and tools, and store them in a separate building from that in which your main manufacturing is done."

The manufacturer of automobiles who had written this letter to the supplier of switches and other special electrical equipment for his cars had thus carried out in two separate ways an important buying policy which is worthy of the attention of all who have purchasing to do. By his insistence upon a dual die equipment he was getting an excellent insurance against failure of the supply. And he was inserting another factor of safety of two when he placed only one-half of his order with one company.

The fact that the switch is only a relatively small part of the complete automobile is entirely beside the point. The product is just as useless without switch equipment as though without an engine. And delays are just as sure to raise costs when brought about from one cause as from the other.

Furthermore, there were other precautions in this particular case. For instance, before placing the order this automotive concern had sent representatives to the prospective supplier's plant to assure themselves that the plant was properly equipped and manned and financed to go through with the contract.

Not often, of course, does one need to go to quite this extent but it well illustrates the principle we should bear in mind of taking all reasonable precautions toward seeing to it that there comes into our receiving room door on the day or during the week they are expected, the materials and supplies that have been ordered. In other words, there must be both an insurance of an adequate supply and an assurance that that ample supply is on hand when wanted. Otherwise that quick turnover of capital so much needed in these days of narrow margins is going to be retarded to the relative speed of the slow-motion movie. And in the manufacturing world there are no profits in such a picture.

Executive heads of many plants would make fewer borrowing trips to the bank if they did more financing from within

Sometimes after moving along smoothly on a well timed and beautifully coordinated production program, a given order suddenly comes to a standstill and there it remains completely stalled for lack of some one part and perhaps a minor part at that. All that was gained by the combined efforts of everybody engaged in its production is suddenly lost, and more too.

The following example of this sort of thing will sound exaggerated but it actually happened in an electrical manufacturing concern of no mean size. A special piece of electrical equipment was not received by the customer when promised. Two weeks after scheduled delivery date, an inquiry set tracers going which found the missing equipment. It had been cast out of the main production stream into a sort of eddy where, with other similar apparatus, it was in effect simply spinning around and making no headway because something was missing for its completion. And what was that something? A nameplate! A ridiculous reason for holding up shipment, yes, but this actually happened and almost as insignificant parts are, by their absence, holding up countless shipments at this very minute because perfectly sound buying policies are not backed up in all cases by rigidly enforced and properly followed up delivery schedules.

So long as purchasing agents follow the shopping-around instinct, we shall have too much material that does not measure up

If disgruntled customers were the only ill to follow in the wake of this evil it would be bad enough, but besides this there is an increase in costs which, although often hidden, exists just the same. A retarding of capital turnover is mighty expensive to say nothing of the cost of special hurry-up measures to rush laggard parts to a job.

Reference has been made to the desirability of one's meeting his raw material or purchased parts requirements by buying each kind from more than one source as a matter of insurance. The Vesta Battery Corporation follows this somewhat common policy of protecting itself by patronizing more than one source of supply.

But as Chester M. Angell, factory manager of this concern points out, "If you split your purchases of any one commodity too many ways, it may not give enough business to any one supplier so that there is sufficient incentive for him to take care of you in particularly good shape. So we try to bunch the orders with two suppliers." This provides excellent middle ground: it gives the insurance one needs without necessarily sacrificing the various service and other advantages that accrue from volume purchases.

To show that this plan is equally workable in the relatively small plant there might be cited an Illinois concern making small motors—a company that would not at all be ranked as large—which relies upon two and sometimes three sources of supply for each of its main materials.

Frequently it happens that it is well nigh impossible to schedule purchases very far ahead. This leads in some cases into a rather serious problem of getting special purchases delivered when needed. With standard materials, the time element can usually be adjusted merely by the paying of a premium if necessary, but in the case of special made-to-order parts, it is quite a different matter.

This typical situation is well illustrated by the experience of the Economy Engineering Company which makes, in addition to hand equipment, a line of motor-driven tiering machines. While many of these machines are somewhat standardized as to driving mechanisms, some of them are highly special. There is for instance what is known as a four-post machine—a large piece of equipment supplied to newspapers for handling huge rolls of newsprint stock. Seldom are any two alike. Nor are they ordered regularly, so they can be anticipated neither as to kind nor number.

Because these machines are special, they require any one of a number of electric motor sizes in either alternating current or direct current. And this of course means that the demands for electric control equipment are spread over a similar wide range.

Obviously a stock of motors and controls in all the possible combinations is quite out of the question. The way out as followed by this company is worthy of mention because it brings out an interesting buying policy so far as special equipment is concerned. Let J. L. O'Brien, the purchasing agent of the concern, explain it. He says, "The only apparent solution of the problem for us is to place such orders with relatively small concerns. In this way, while our volume is not large, it is vastly larger in proportion than it would be for one of the big companies. At least it looms large enough to the small company to warrant their giving considerable attention to our needs.

"We feel that we can work more nearly on a man-to-man basis with such a company which is not so ponderous but what it can and is willing to break the red tape if necessary to get our stuff out when the need arises for emergency action. We realize perfectly that it would not be reasonable to expect the larger companies, in most cases, to upset everything to push through our order."

While counter arguments exist, it is hardly within the province of this article to pursue them. The policy is mentioned here because in its execution is provided a "way out" of a difficulty sometimes encountered by buying executives.

Overbuying has, in years gone by, been listed by representative credit information sources as one of the principal causes for business failures. Since the expensively learned lesson of 1921 and 1922, it is doubtful if executives, by and large, require the warning in this direction that they formerly did. Hand-to-mouth buying, thought of during the earlier post-war years as a temporary condition, seems to have settled itself on us as more or less of a fixed policy.

The effort consumed in speculative buying will bring larger returns if directed toward a reduction of true manufacturing costs

But because overbuying is not the evil that it once was, does not mean that there is non-existent the problem of buying the right quantity. There is a one right quantity to buy of each commodity whether that quantity be more or less than in former days. The problem is still there. The sizes of the numerous variables have changed, that's all.

This phase of today's buying problem as it exists with countless electrical manufacturers is well expressed by Mr. Angell of the Vesta Battery Corporation. He says, "We buy closer to our needs than we used to do. We make the other fellow carry the inventory wherever this is possible. Our tendency now is to buy in terms of weeks rather than of months ahead of our requirements."

The purchasing agent at the Belden Manufacturing Company points out that letting the other fellow carry the inventory not only saves a considerable amount in capital investment but the conservation in space for storage may be quite an element. Both factors enter rather directly into costs.

Even if there were no other urge to buy closer to needs, self-protection might well force a manufacturer to encourage the supplier to carry the inventory. Self-protection in the sense explained by C. D. Bodine, Bodine Electrical Company—"To offset the growing tendency," he says, "for the buyer of our own product to contract for his supply and have us hold the goods until called for, we have to buy much of our own stuff on that basis, too. Else we would tie up capital and space at both ends—in raw materials on the one hand and in finished goods on the other."

Buying rather close to one's needs according to present-day custom has the excellent by-product advantage that losses from obsolesence are likely to be greatly reduced and hence costs favorably affected. If the manufacturing plant were recognized as a dealer in raw materials, obsolesence would not be the serious factor it is, for then it could do what the retail store does—gradually cut the price till the stuff is moved. But not so with the factory. Here it is a case of something or nothing—expensive material whose cost may reflect a considerable measure of processing labor or its fractional value as scrap. There is little possibility of the middle-ground bargain table. So any buying policy that tends to reduce loss through obsolesence has a distinct cost-cutting advantage.

Mr. Thomas for many years was managing editor of Factory *and during that time he became acquainted with many electrical manufacturing executives and their problems. He is a graduate of Worcester Polytechnic Institute. He was formerly connected with the DeForest Radio Telephone Co., and the American Telephone & Telegraph Company*

L. I. Thomas

Executive heads of many plants would make fewer borrowing trips to the bank if they did more financing from within—more holding down of inventory to real active, rapidly turning items of stock. And of course the possibility of this generally gets back to the feasibility of scheduling production sufficiently accurately so that stocks of raw materials may be kept in proper balance.

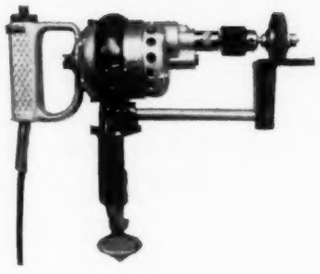
It is almost trite to mention the importance of buying so as to insure the proper quality. It is equally obvious to restate the axiom that immediate low cost may be ultimate high cost if the material purchased isn't right. And yet so long as we have with us the purchasing agent who is endowed with a superabundance of the "shopping around" instinct, we shall find on our hands too much material that just doesn't measure up. A steep upward climb in the customers' complaint record may indicate a damage to reputation that far outweighs even the most optimistic expectancy of savings to be made in bargain hunting.

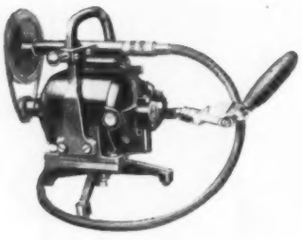
That the proof of the pudding is after all in the eating is behind the wise insistence of many buyers in full and complete service tests. One maker of machinery using motor drive insists that in the case of the motor controls, which are purchased ouside, no change shall be made to a new supplier until the new product is tested in actual service over a long period—sometimes as much as a year.

While the effect on costs is less direct, this insistence upon service tests often makes decided savings in those branches of a manufacturing business which call for maintenance materials. A case in point is maintenance painting,

(*Continued on page* 50)

WHAT Determines Choice of Motor for *Your* Product?





Herein is discussed the engineering side of the motor buyer's problem in selecting the proper motor for his machines and appliances

By H. L. Smith

Industrial Engineering Department
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H. L. SMITH was born in Cape Town, Union of South Africa. He graduated with a B. S. degree from South African College, now known as University of Cape Town. After a short experience in station operating, he went with the General Electric Company in 1916. In 1919 he transferred to the International General Electric Company. Since 1923 he has been a member of the Industrial Engineering Department of G. E. Company, working on motors.

BOTH engineering and economic conditions must be taken into consideration when selecting a motor for a motor-driven appliance or machine. Among the economic conditions are such things as the price and servicing features of the motor. Other commercial considerations are speed of delivery, cost of delivery, availability of replacement parts, and the past performance of motors of the type in question.

Of equal importance is the engineering problem involved. It is real economy to meet correctly the engineering features of the installation. If a motor is selected which is not adequate for the work that is required of it, the customer of the motor buyer will refuse to purchase his product. This, in turn, will force the machine manufacturer to buy a complete new set of motors for his apparatus. He will have lost a large amount of money, and will have created dissatisfaction among his customers, which ill-feeling will set up sales resistance to the new unit.

It is necessary to determine accurately the requirements of a motor which is to operate successfully under any given conditions. Specifications cannot be determined by guess. A preliminary study of the existing conditions must be made by an engineer in order that an intelligent application of motors may be made and suitable devices installed with them for their protection.

Temperature Rise Is Important

A MOTOR develops torque and speed, the two elements required to drive any load, but temperature rise must also be considered. To operate successfully, a motor must be of such size and design that it will start and accelerate under any reasonable load which it may be called upon to bear, carry any reasonable overload, and also be capable of carrying its normal load for the period of time required, without bringing about a temperature rise which would cause deterioration of the insulation.

In selecting a motor, the starting and accelerating torques should be a primary consideration. After the starting torque requirements of the driven machine have been determined, the ratio of starting torque to normal torque should be noted. This ratio, if relatively large, indicates that a slip-ring or high resistance rotor alternating current motor is preferable to the standard squirrel-cage motor, and a compound or series wound direct current motor should be selected in preference to a shunt-wound machine. A similar method may be used for service requiring frequent starting, and careful consideration of the starting and accelerating torque frequently permits the selection of a motor of a smaller horsepower rating than could otherwise be employed.

The point of next importance is the peak load which may be encountered. Ample margin must be allowed between the requirements of the driven machine and the maximum torque developed by the motor. For example, if an induction motor were selected with a maximum running torque only slightly greater than the peak load, it is quite possible that the motor would stall if the voltage should fall at the time this peak load occurred.

The next consideration is the horsepower rating. This is a measure of the motor's ability to do the required work for

a specific period without exceeding the safe heating limit or violating other requirements of successful operation, such as good commutation. It might be noted here that neither of the ratings, whether 40 deg. or 50 deg., indicates the temperature rise which will be obtained, but simply the limit of the temperature rise which should not be exceeded.

The great number of available alternating and direct current motors can, from a standpoint of speed, be divided into four groups. One of these classes consists of the so-called constant speed motors. The speed of these is either constant, as with a synchronous motor, or does not vary materially with the load, as in the case of squirrel-cage motors, slip-ring motors with rings short circuited, and shunt-wound direct current motors.

Multi and Adjustable Speed Motors

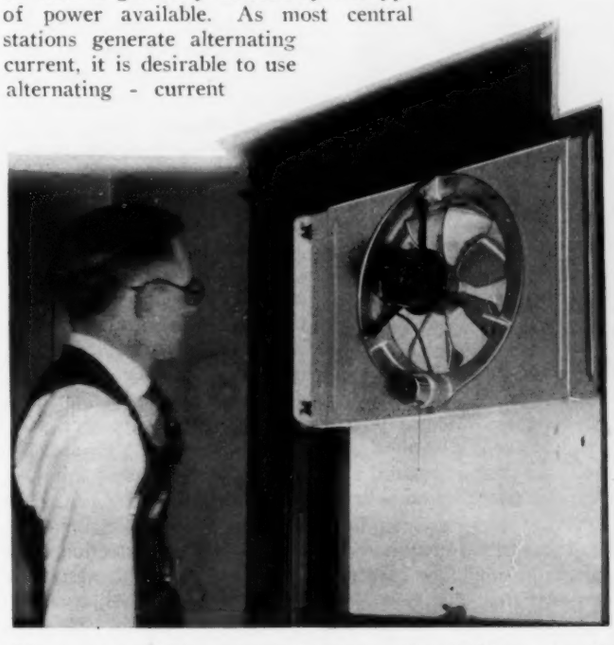
THE next of these groups contains the multi-speed motors. These motors may be two, three or four-speed and may be operated at any one of the several definite speeds, each being practically independent of the load. Examples are direct-current motors with two armature windings or induction motors with primary windings capable of various pole groupings.

In the third class are the adjustable-speed motors. This group covers motors whose speed can be varied gradually over a large range and, when adjusted, remains practically unaffected by changes in load. Shunt-wound motors designed for speed variation by field control and alternating current brush-shifting motors with shunt characteristics are in this group.

Varying speed motors make up the fourth and last group. The speed of such motors varies with the load, ordinarily decreasing as the load increases. This covers direct-current series motors, compound-wound motors with light shunt fields and high resistance squirrel-cage motors. As a subclass of these varying-speed motors there is the adjustable varying-speed motor, the speed of which can be varied over a wide range, but in which the speed, when once adjusted for a given load, will vary greatly with changes in load. Examples are the slip-ring motor operating with resistance in the secondary circuit and the alternating current brush-shifting motor with series characteristics.

Whether alternating-current or direct-current motors will be used is generally decided by the type of power available. As most central stations generate alternating current, it is desirable to use alternating - current motors. The alternating-current motor has the advantage of being very simple and of sturdy construction, as well as having a low first cost. For constant-speed service, the squirrel-cage induction motor is the simplest and is suitable for all applications where the torque required during starting is not abnormally high. Its one disadvantage is the high current drawn at starting, and in motors above 7½ hp. it is usually necessary to reduce the voltage applied across the motor terminals at starting. This may be done by inserting resistance in series with the primary winding or by means of a compensator. The first, which is a resistance starter, is cheaper and well adapted for motors up to 20 hp., provided the starting torque required is low—50 per cent of full load. Above this, however, the compensator is more desirable as it has the advantage of a higher torque per ampere of starting current than the resistance type of starter.

This illustration is an example of a motor directly connected to a woodworking machine. A careful selection of motors is necessary for this type of work



The selection of the proper motor for smaller appliances like the domestic ventilator unit shown above is just as important as motor selection for large machines

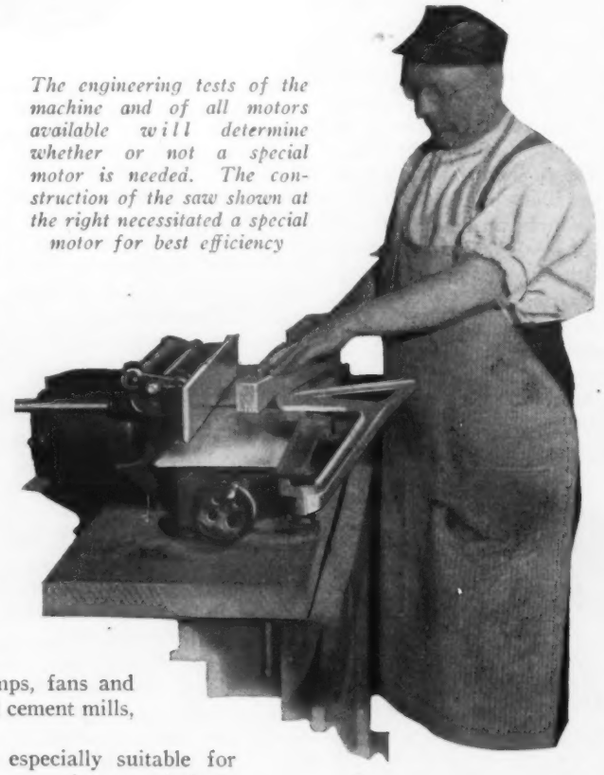
Special Type Squirrel Cage Motor

SQUIRREL-CAGE motors are now available which are designed for full voltage starting. With this type of motor, the starting current is greatly reduced from that required by the standard type of squirrel-cage motor, especially where high-speed units are used. In the smaller sizes these motors are designed to give a high starting torque, making them especially suitable for many loads which formerly required wound rotor motors with secondary resistance. The simplified control problem with this type motor is bringing it into widespread use for many purposes. Instead of having secondary resistance for adjusting the starting torque and a line switch, only the line switch is needed with the full-voltage starting motor.

On loads requiring comparatively high torque during starting it is best to use a slip-ring induction motor, although there are certain cases where high resistance, squirrel-cage motors are suitable. The slip-ring motor has the advantage that the current during acceleration can be limited, this being usually an average of 125 per cent of full load current. This makes a slip-ring motor especially suitable for large sizes and where the capacity of the system is comparatively small, or where the motor is located at the end of a long feeder.

The slip-ring motor is also used where the equipment must be operated at different speeds, these motors being suitable to operate down to 50 per cent speed by inserting resistance in the secondary. It is not advisable to reduce the speed below 50 per cent as the motor has a series characteristic with resistance in the secondary, which may cause instability at less than 50 per cent of full speed.

When a slip-ring motor is operated at reduced speed by using resistance in the secondary, power is wasted in this resistance, this power being practically proportional to the reduction in speed. When the load is such that the motor must be operated for long periods at greatly reduced speeds, it is often more economical to use a brush-shifting type of motor which has a very much better efficiency, as well as power factor, than the corresponding slip-ring motor at reduced speed. For this reason a great number of series type alternating-current brush-shifting motors have been used for driving mine fans and forced draft fans in power houses. There are now two types of alternating-current brush-shifting motors—one with the series characteristic and the other with a shunt characteristic. The former is very suitable for such loads as fans and pumps. The shunt type, as its name implies, has a very small change in speed with changes in torque after the speed has been adjusted for any particular load. As well as being adapted for driving fans and pumps, this type of motor is especially suitable for driving stokers, tube machines and calenders in rubber factories, tentering frames and calenders in textile mills, cloth printing machines, bakery machinery, aluminum foil machines, and some steel mill main roll drives. This motor is especially suitable for any load requiring adjustable speed on which the variation of speed with changes in load must be small.



The engineering tests of the machine and of all motors available will determine whether or not a special motor is needed. The construction of the saw shown at the right necessitated a special motor for best efficiency

Another type of alternating-current motor which has a wide field of application, but which has not been as extensively used as the induction motor, is the synchronous motor. This type has a constantly increasing scope of usefulness. Among the various applications may be mentioned the driving of motor-generator sets, air and ammonia compressors, pulp grinders, stone crushers, centrifugal and reciprocating pumps, fans and blowers, tube, flour, rubber and cement mills, etc.

The synchronous motor is especially suitable for direct connection to machines operating at relatively low speeds. An induction motor, when designed for a great number of poles to operate at a low speed, has a very poor efficiency in small sizes and an even worse power factor; the synchronous motor for the same condition has a relatively good efficiency and is even cheaper. For this reason, the synchronous motor has probably found its greatest field in driving low-speed machines similar to air and ammonia compressors.

Synchronous motors today are made self-starting and synchronizing and are equally as reliable as induction motors. One distinct advantage of the synchronous motor is that it can be operated at unity power factor or at a leading power factor. Operating at a leading power factor, these motors furnish reactive kv-a for power factor improvement at a minimum cost.

Investigations of industrial plants are continually showing that many machines and line shafts are over-motored. This makes for poorer power factor and increased line drop, which, if the proper study is given to the actual load conditions, can easily be eliminated. In the same way, machine tools and other machines driven by separate motors are sometimes over-motored, with the same resulting effects.

Some machines present steady loads which can use synchronous motors to advantage. The leading power factor of the synchronous motor helps correct the power factor of lightly loaded induction motors elsewhere on the system. Since a synchronous motor starts as an induction motor and then pulls into synchronism, it is not suitable for loads requiring high starting torque. Types of synchronous motors have been developed which allow the motor to come up to synchronous speed and then pick up the load gradually, thus making them applicable to a larger field. One of these types has the stator frame arranged so that it can rotate. This motor is started in exactly the same manner as the ordinary synchronous motor, but instead of the rotor turning, the stator revolves and comes up to full speed. The field voltage is then applied and the motor is synchronized. The stator is equipped with a hand brake, which is applied gradually after the stator has been synchronized. As the stator speed decreases, the rotor, which is connected to the load, picks up speed. The braking is continued until the stator comes to rest. At this point the rotor is revolving with the load at synchronous speed. The great advantage of this motor is that it exerts maximum pull-out torque for starting and accelerating the load. This makes it well adapted for drives which are entirely unsuited for operation by the standard type of synchronous motor without requiring the use of magnetic clutches.

The direct-current motor most commonly used is the shunt-wound type, applicable for all drives demanding constant load, and where rather close speed regulation is required. This type of motor should also be used where adjustable speed is necessary. The compound wound motors should not be used for adjustable speed service, but are suitable for adjustable varying speed or so-called constant speed. The compound wound motor is especially applicable where loads demand high torques for heavy starting duty. Series motors are used where high torque is demanded and where high speeds and light loads are not objectionable; these motors, however, should never be belted.

Having decided upon the proper type of motor for the particular set of conditions imposed, overload protection for the motor should be carefully considered. It is an absolute necessity that the motor be adequately protected against overloads. A careful study of governing conditions should be made. A thorough discussion of the various uses for and applications of the types of overload protection will be given in the May issue of Electrical Manufacturing.

TEAMWORK *in Handling* Factory Materials

By

C. B. CROCKETT

AND

H. H. PAYNE

Flexible handling system using electric trucks to tie together the movable assembly units meets the changes demanded by expansion in the radio plant

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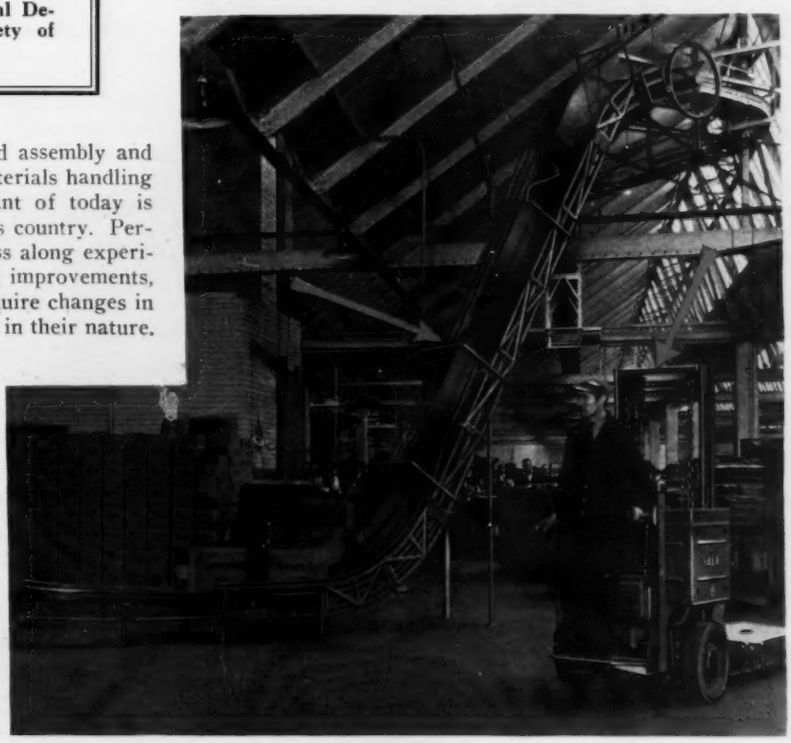
Mr. Payne formerly occupied the same positions in The Society for Electrical Development and The American Society of Mechanical Engineers.

IN its multiplicity of parts, complicated assembly and need for a dependable yet flexible materials handling system, the radio manufacturing plant of today is not unlike the great automotive plants of this country. Perhaps nowhere is there such constant progress along experimental lines. The resultant changes and improvements, such as the introduction of the A. C. set, require changes in process and assembly sometimes very radical in their nature.

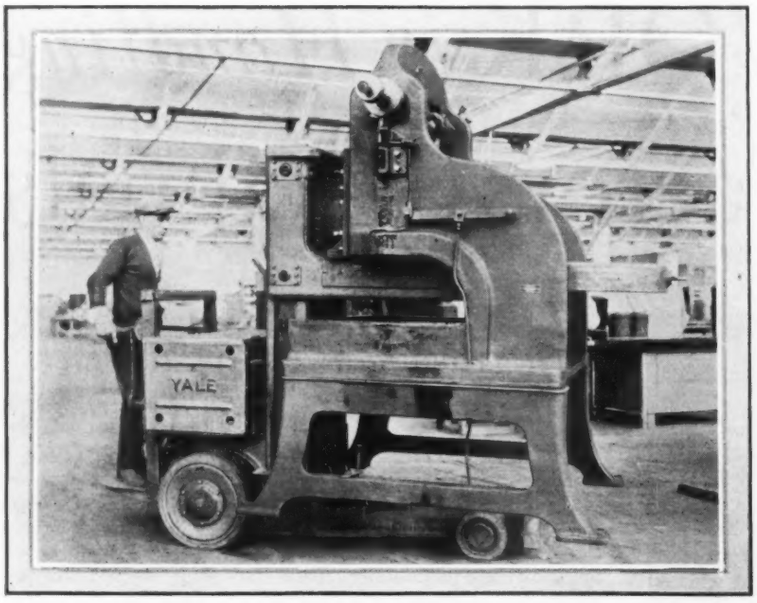
To keep pace with the constantly varying demands on the plant and to do so at a minimum expense, the executives of the Atwater Kent Manufacturing Company have designed their plant, with one exception, around a system of movable assembly units tied together by the most flexible of all materials handling equipment, the electric truck. The power conveyor handling finished sets from final inspection and packing to shipping or storage has made this operation one of the few which has not been changed since the first unit of the plant was opened in 1925. In fact, this equipment has fixed the position of the final assembly line so that additions to the plant have been so arranged as to keep the final process in the same location. In line with efficiency, the unit assemblies are made on short belt conveyors which can be moved or changed at a minimum of expense, while the main transportation system of electric trucks and trailers takes care of any changes without cost. Expansion of the plant is taken care of by the purchase of additional units, as witnessed by the fact that six electrics are now in service, the fleet having grown from the one truck, which was purchased in 1925.

The Atwater Kent plant, located at Philadelphia, consisted of one unit when opened three years ago, but so rapid has been the growth of this concern that there are today four units with a total floor area of 15 acres. The plant employs about 4600 people, and has a capacity of from 2500 to 6000 radio sets and loud speakers a day.

Radio manufacturing is not generally classed as one of



Finished Atwater Kent radio receiving sets coming from the sealing machine and bound for the shipping room via the ceiling conveyor. Arrows indicate the conveyor and one of this plant's fleet of six electric trucks



Machines like this may be moved by eight or ten men, but the Atwater Kent plant finds this lift truck is safer and more economical

those industries involving the handling of large amounts of material, and the figures are little short of astonishing. In February, 1928, material received at the unloading platform totalled 4,271,000 lbs. This material, it is estimated, is handled approximately ten times, exclusive of the handling on the unit assembly lines, and over a total distance of approximately 2500 feet. Total weight handled is, therefore, about 21,000 tons per month and in terms of distance transported amounts to close to 1000 ton miles.

The different handling processes are assigned to each of the six electric trucks, and a description of their duties will point out how this company has solved its individual handling problems.

The receiving platform accommodates five box cars and is served by two three-ton high lift trucks. Incoming material, comprising loose steel sheets, boxed copper bars and plate, wire, paper and miscellaneous bulk material and supplies, is loaded on skids of 5000 lb. capacity, picked up by the truck, weighed and placed either in storage or at start of process. Sheet steel is piled on each side of the box cars so that a skid may be placed between the piles. With one man at each end the sheets are easily transferred to the skid, and the truck, entering the box car, picks up and removes the load. Each truck load is accurately weighed and Mr. Hambach, superintendent of transportation, may regard with pride his average figure of 34 cents per ton for unloading, weighing and storing away incoming material. The material has to be handled by elevator between the platform and the main floor and it is proposed to eliminate the time consumed by the truck while waiting for the elevator by putting a truck on each floor, carrying only skids on the elevators.

Sheet steel for cabinets and speakers is deposited along one side of the stamping room at the incoming end of the lines of presses. The material then moves down the line of presses, an average of three stamping operations being necessary on each piece. It is here that trailers are first employed, being pushed by hand between these machines. The material only leaves the trailers while passing through the presses. Aside from its regular duties, the truck assigned to incoming material handles the dies to and from the presses, thus greatly decreasing the time when these machines otherwise would be forced to remain idle.

Often a truck is used on repair work. The platform of the high lift truck, for instance, provides a means for raising men and material to the top of the machines. At other times a truck is used to support some part while being placed in final position. As the floor superintendent remarked, the truck is as much a production tool as it is transportation equipment.

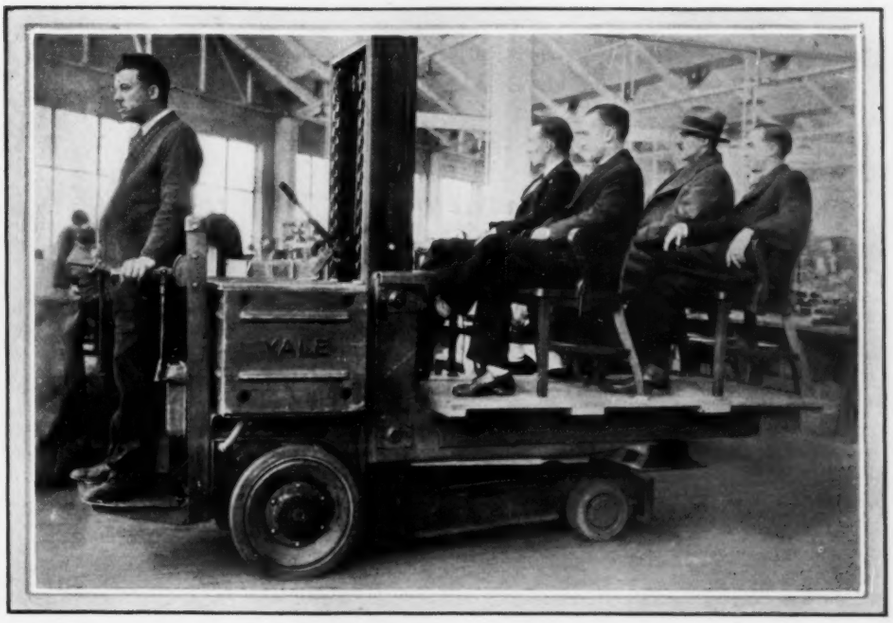
The stamping and spot welding completed, the loaded trailers are placed along the broad aisle which parallels the incoming aisle on the other side of the room. It is here that the visitor first comes in contact with the regular tractor trailer system of the plant. This system connects the departments where separate pieces such as cases, coils, bases, and condenser plates are completed with the main assembly room, transferring these parts to the head of the intermediate assembly lines or carrying finished cases from the paint room to final assembly.

Starting at the point where the cabinets have been spot welded, a train returning from the main assembly room with empty trailers picks up these loaded ones and proceeds to the cleaning and paint room. Here the cabinets are passed through cleaners and dryers on belt conveyors and are ready for spray painting. After painting, a spe-

A trainload of cabinets and loud speakers bound for final assembly. Often eight trailers are drawn by one electric truck, and though the raw material is light, a total of about 5,000,000 *pounds was received and handled in February*

cial trailer is used similar to the skeleton framing found in plant stockrooms for storing boxes. These trailers are approximately six feet high, six or seven feet long, and two and a half feet wide, mounted on four wheels. The shelves are spaced to just accommodate either a cabinet or a loud speaker.

These trailers are loaded in the paint room and made up into trains, the destinations determining the make-up. In its regular course from the stamping room, the truck brings in a trailer train of empty trailers from the assembly room and loaded trailers carrying unpainted cases; it returns with empty trailers for the stamping room and loaded ones for the assembly lines. Stopping to pick up other loaded trailers, the train proceeds to the main assembly room of the plant.



Visitors to the Atwater Kent plant ride in chairs bolted on a special skid carried by an elevating platform "special emergency" truck. The other five trucks are assigned regular duties in the various departments of the plant

This room, measuring some 440 by 360 feet, with a saw-tooth roof that floods it with sunlight, presents a scene which holds the average visitor spellbound. Down the center of the room is a broad 20-foot aisle, the main artery for material movement. At right angles to this aisle are twenty assembly lines at which sit hundreds of men and girls operating small automatic machines or inspecting parts with such rapidity that a dozen pieces may have passed before the spectator grasps the operation. These lines are made up of two benches with a belt conveyor in the middle. The number of operations may be changed by making a corresponding change in the length of the belt conveyor, either adding or withdrawing a unit from the assembling bench.

Between every two assembly lines run transverse aisles about 12 feet wide, with a curb of wood bolted to the floor which adequately protects the workers along the assembly lines. At the head of these aisles, the material is deposited for the workers on either side. Most of the material for these unit assemblies is small and carried in trays which may be piled one on the other. The different assembly lines are serviced by the electric truck in its regular rounds, a fresh supply of material being needed on an average of twice a day. This feeding of the assembly lines is so carefully worked out that the truck can supply one or two lines with material on each trip, and thus avoid any chance of several lines running low at the same time.

Trailers or trays are deposited at the foot of each line and, when loaded with assembled parts, are joined to the trailer train moving to the final assembly. This final process differs only slightly from the unit assembly, the belt being longer and larger and the material being deposited at the proper locations beside it. The finished machines stay on the conveyor when completed and pass through a series of exhaustive tests. The final steps of boxing, sealing and transfer to the shipping room are accomplished by belt conveyors. The management said that this final assembly belt and the conveyor to the shipping room were practically the only equipment whose location or make-up has not been changed to keep pace with the growth and improvements of the past three years. Changes and the neccessary expense had been avoided, they said, due to the flexibility of the rest of their handling and unit assembly.

Sheet steel for cabinets and loud speakers is unloaded from cars and transferred to the presses by a high lift truck and skids. Dies are also moved rapidly in and out of presses by use of the truck, thus cutting idle machine hours to a minimum

Analysis of Wholesale and Retail Electrical Trade Shows

Chicago Sales Exceed $180,000,000

Electrical manufacturing establishments turn out products valued at more than $156,000,000

THE table below presents an analysis of wholesale and retail distribution of electrical appliances and supplies, in Chicago for 1926, together with certain findings taken from the Census of Manufactures of 1925. The Census of Distribution for 1926 was taken by the United States Bureau of the Census, with the cooperation of the Chicago Association of Commerce, whose Committee of Business Research has worked out this table. The distribution analysis produced, for the first time, merchandising facts covering the sales of 61 classes of stores, dealing in 80 kinds of commodities.

Total sales of electrical appliances and supplies by 269 wholesale outlets in Chicago were $164,176,500, while 688 retail establishments reported a sales total of $15,848,700, a grand total of more than $180,000,000. The products turned out by electrical manufacturing establishments in 1925 were valued at $156,409,829. These manufacturing figures include electrical machinery.

Electrical appliance wholesale business ranked twelfth in importance, and retail business, thirtieth. Electrical appliances and supplies sales at retail amount to less than one per cent of the total sales of all kinds of merchandise, and to $4.31 per capita of population, there being 11,906 people in Chicago for each retail electrical appliance and supplies store.

The 688 retail outlets represent all of the stores through which electrical appliances are sold. Many small dealers who did not keep books by departments were unable to show sales of electrical appliances. It is to be assumed that there are many more than 688 retail outlets for electrical appliances in Chicago.

In computing turnovers, it is first necessary to determine the average cost of the merchandise sold. Should the average cost of the merchandise sold for $1 be 70 cents, the figure given in the table for turnover should be multiplied by 70 per cent; the resulting figure will represent the number of times the entire inventory is turned each year. Thus, if a dollar's worth of electrical appliances costs the dealer 70 cents, the turnover figure of 7.4 in the table should be multiplied by 70 per cent, the result being 5.18, indicating that the dealer turns his inventory slightly more than five times per year.

The manufacturing establishments in 1925 paid out $29,133,680 for wages, representing a wages cost percentage of 18.6. Output of factories, wholesale and retail sales combined exceeded $333,000,000.

The average sales of each salesman for wholesale houses was over $148,000 and the total payrolls of these houses were 5.9 per cent of the total sales. The average sales of each retail salesman were about $20,000, retail house payrolls being 17.5 per cent.

Distribution of Electrical Appliances and Supplies in Chicago, 1926

	Wholesale		Retail		
Number of outlets	269		688		
Sales (commodities)	164,176,500		15,848,700		
% of Apparatus group total	97.4		83.9		
% of Grand total	3.4		0.8		
Commodity Sales by Stores		No. of Outlets		% of Total	Av. Sales per Outlet
Electrical appliances and supplies		256	12,708,200	80.2	49,641
Department		13	1,476,900	9.3	113,608
Variety (incl. 5 cents to $1 stores)		87	458,500	2.9	5,270
Stoves and ranges		16	199,800	1.3	12,488
All others		316	1,005,300	6.3	3,181
Totals		688	15,848,700	100.0	23,036
Sales (by establishments)	163,968,300		13,140,000		
% of apparatus group total	97.3		84.0		
% of Grand total	3.4		0.7		
Per capita sales			4.31		
Number of inhabitants per store			11,906		
Average sales per establishment	769,804		51,328		
Number of establishments	213		256		
Less than $100,000 annual volume of sales—single stores	71	Less than $5,000	72		
$100,000 to $249,999 single stores	58	$5,000 to $9,999	26		
$250,000 to $499,999 single stores	24	$10,000 to $24,999	49		
$500,000 to $999,999 single stores	26	$25,000 to $49,999	42		
$1,000,000 to $2,499,999 single stores		$50,000 to $99,999	20		
$2,500,000 to $4,999,999 single stores	4	$100,000 to $249,999	14		
$5,000,000 and over	4	$250,000 and over	4		
Inventories (at cost)					
Average for year (all est.)	8,539,600		1,776,900		
Turnover (times per year)	19.2		7.4		
% of apparatus group total	93.8		72.9		
On Dec. 31, 1926	8,865,700		1,719,200		
Average for year (ind. store)	40,092		6,941		
On Dec. 31, 1926 (ind. store)	41,623		7,106		
Year end increase over av. (amt.)	1,531		165		
Year end increase over av. (%)	3.8		2.4		
Salaries and wages	9,641,400		2,296,700		
% to sales	5.9		17.5		
% of apparatus group total	94.7		85.4		
Total persons engaged	4,621		1,478		
Firm members and proprietors	87		237		
Total number of employes	4,534		1,241		
% of selling employes	24.3		52.7		
% of non-selling employes	25.5		47.3		
Average sales per employe	35,500		8,890		
Average sales per selling employe	148,522		20,092		
Average salaries and wages per employe	2,126		1,851		

	No. of establishments	No. of employes	No. of firm members and props.	Wages	Wages Cost Percentage	Products or Sales
Mfg., 1925	199	19,381 (a)	(b)	$29,133,680	18.6	$156,409,829
Wholesale, 1926	213	4,534	87	9,641,400	5.9	163,968,300
Retail, 1926	256	1,241	237	2,296,700	17.5	13,140,000
	668	25,156	324	$41,071,780	12.3	$333,518,129

Symbol:
(a) Mfg.—salaried employes not included.
(b) Mfg.—not shown separately.

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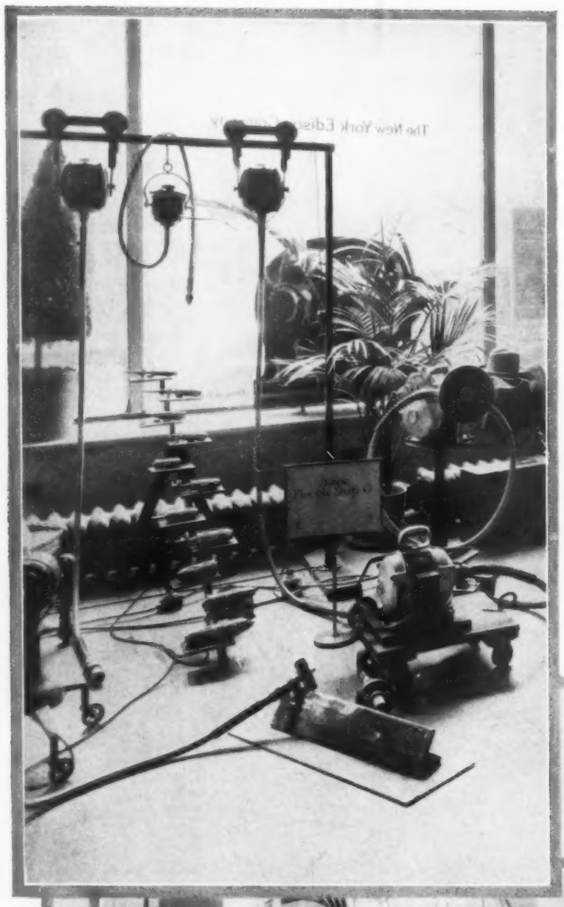
NEMA is the National Electrical Manufacturers Association, which was established in 1926 by the consolidation of the Associated Manufacturers of Electrical Supplies, the Power Club, and the Electrical Manufacturers Council. In less than two years it has developed a leadership and accomplished results which deserve the confidence and support of all electrical manufacturers

F. E. Neagle
Counsel

Selling Portable at a Central



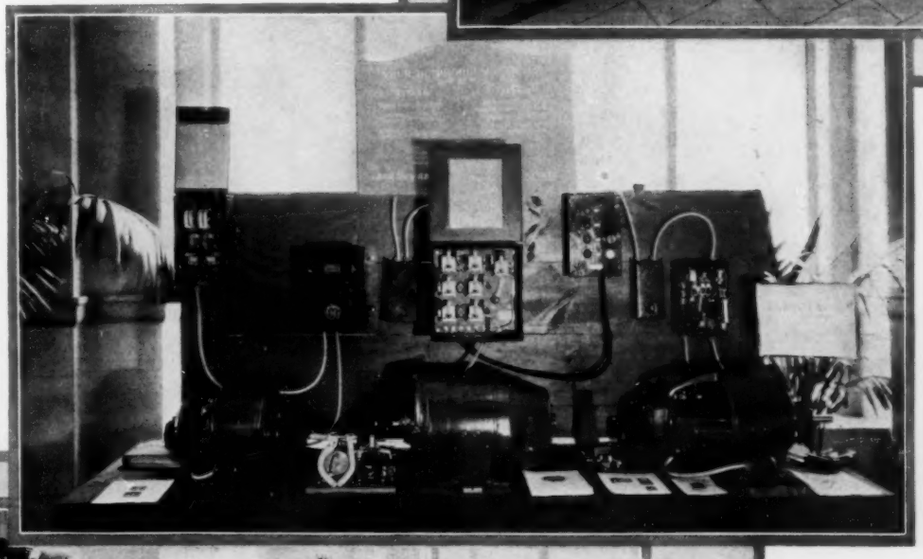
MANUFACTURERS of portable electrical tools for use in wood and metal working and various other crafts increase their markets by taking space in such exhibitions as the Annual Power Show, which is held by The New York Edison Company. During the exhibition Feb. 20-25 several of the 18 manufacturers who displayed their lines made a large number of floor sales. Such shows focus the attention of industrial buyers upon the advantages of using electricity in the portable tool field. Experience has proved that the largest sales returns from these exhibitions are earned by those manufacturers who send individual invitations to their prospects, asking them to visit the show and see the tools in action

IN such exhibits as these, the electric motor, as the handy man in the industrial plant, attracts and holds the attention. These views of the power show held in New York visualize the portable electrical tool as able to go a long way toward selling itself to those who need it

ATTRACTIVELY designed exhibits draw large numbers of spectators, and probably only a minority visit the show solely out of curiosity. Hence the opportunity of the manufacturer's representative to use his sales talk where it will bring results

Electrical Tools Station Show

ONE manufacturer who sent out invitations to his customers and prospects averaged between four and five floor sales daily during the week of the Power Show held in New York City. In addition, this company obtained from visitors many new names for its prospect list. Manufacturers can gain the cooperation of central stations in staging portable electrical tool exhibitions, because every increase in the use of these tools means an increase in the central station load. Power shows are particularly adapted to the introduction of new or improved electrical tool models. The adaptability of these tools to attractive exhibition purposes is illustrated by the views which are shown on this page and the opposite one



ABOVE an electrical ash hoist is shown; at the right, three types of motor starters for D. C. service; below, woodworking lathes. And these are only a few of the many types of electrical apparatus which lend themselves to power show exhibition purposes

WOOD-WORKING exhibits may include those types which men like to have in their shops at home, as well as those designed for use in industrial shops. Progressive manufacturers know that well-managed power shows build markets for portable electrical tools

Electrical Manufacturing

READER-FRIEND: In your hands you hold a copy of the first issue of ELECTRICAL MANUFACTURING. To help you become better acquainted with it and to discover its value to you, the publishing purpose behind the new paper and the policies which will govern the editor in carrying out that purpose are published below. Remember, please, that the editor earnestly desires to maintain a friendly and helpful contact with his readers; and, therefore, comments, criticisms, or suggestions for improving the service of the paper month by month will always be in order and welcomed.

THE EDITOR

Publishing Purpose

ELECTRICAL MANUFACTURING is a business paper published monthly for all manufacturers of all electrical products, including motor-driven appliances, equipment, and apparatus.

Its purpose is to supply information, to report news, to present facts and figures, to point out trends, to interpret current conditions, and events, to broadcast ideas, to promote helpful contact and friendly cooperation, to record experience and progress and to serve in other ways with enthusiasm and inspiration the needs of the electrical manufacturing field.

The readers of the paper will be the executive officers, sales and administrative managers, engineers, superintendents, and the various department heads of electrical manufacturing concerns and also of those concerns which make a business of servicing and repairing electrical products of all kinds after they have been sold.

Every issue of ELECTRICAL MANUFACTURING will contain a complete classified index of all manufacturers and suppliers of materials, parts, or accessory equipment used in the manufacture and repair of all electrical products and motor-driven appliances and machinery.

In every issue the editorial content of the paper will be balanced under the following general heads: production, marketing, administration, and servicing. Technical and engineering subjects coming under these heads will be covered editorially, but the chief purpose is to aid the electrical manufacturer in developing his business and increasing the sale of his products, to help him coordinate his group activities with those of other groups in the electrical industry, and to strengthen him as a factor in American business and the prosperity of the nation as a whole.

Editorial Policies

IN the execution of this purpose, the editor of ELECTRICAL MANUFACTURING will be governed by policies that have stood the test in many years of publishing experience. These policies are as follows:

To maintain wide and intimate contact with the field served.

To seek advice and assistance from leaders within the field.

To put behind every article the strongest possible authority.

To deal fairly with all manufacturers whether large or small.

To deal evenly with both association and non-association manufacturers.

To avoid controversial questions as far as possible.

To present impartially all sides of a subject.

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To grant a hearing to all but special privileges to none.

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To promote those ideas and ideals which make for progress.

To serve with the largest possible vision, courage and leadership.

New England Holds Her Place in Electrical Production

Survey shows increasing capacity and improved manufacturing methods in six states whose plants sell largely in other sections

NEW ENGLAND'S place in the electrical manufacturing industry has been outlined in a report prepared by M. S. Thompson of the research department of the New England Council, from the replies to a questionnaire sent out by the Department of Commerce. This report does not purport to be a complete analysis of the industry in the New England states; but although it shows only part of the information gathered by the Department of Commerce, it gives a graphic picture of the extent, growth and practices of electrical manufacturing in that section of the United States.

The value of the products turned out by all New England establishments engaged primarily in the manufacture of machinery, apparatus and supplies for use directly in the generation, storage, transmission or utilization of electric energy climbed above $203,000,000 five years ago and represented 16 per cent of the country's total electrical manufacturing output. At that time the size of the plants was increasing and wages of workers had doubled during the previous nine years. Electrical manufacturing in New England is confined chiefly to Massachusetts and Connecticut and the plants in those states, on the whole, are larger than those in most of the other sections of the country.

Duration of Plant Operation

ELECTRICAL manufacturing plants have been operating in New England on an average of twenty years; 32 per cent have been established within the last ten years, 17 per cent have been operating for more than thirty years and 9 per cent for at least fifty years. The original management has been retained throughout the entire existence of two-thirds of these plants. Of those which are not operating under the original management, 75 per cent have made a change within the last six years. The average period under present management for all companies reporting is twelve years.

With a few exceptions these plants have been used for the manufacture of electrical equipment throughout their entire history. These exceptions include former products, such as automobiles, jewelry, arms and ammunition and silk. One plant which is almost a century old has followed the development of lighting fixtures thus: "First made tinware, then kerosene lamps, then gas fixtures and fittings, and then present products."

Plants Are Near Markets

THE reasons given for locating or continuing in New England are as follows, with the number of companies reporting each: labor conditions, 18; home territory, 17; accessible raw materials, 15; nearness to market, 14; freight rates, 2; transportation facilities, 4; banking facilities, 5.

In Massachusetts nearness to market stands equal with labor conditions. Branch plants have been established by 12 per cent of these companies. The majority of companies have established their plants locally, in New England or eastern United States, but two have plants in England and Germany. Several plants are branches of large companies located outside of New England.

Additions to total plant capacity have been made by 35 per cent of these plants since 1921. Such additions have ranged in size from 5 per cent of the former capacity to ten times that of 1921, with an average increase of 134 per cent for the group. No reductions in total plant capacity since 1921 have been reported.

Utilization of capacity is determined by the percentage which output bears to maximum capacity. The 1925 output ranged among individual plants from 25 to 100 per cent

Survey of Electrical Manufacturing in New England

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Approximately 34 per cent of workers are paid on an incentive basis.
Total sales increase since 1921 have been 95 per cent.
New England absorbs 28 per cent of total sales.
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of maximum capacity, with an average for the group of 73 per cent. Capacity was equaled by 9 per cent of the plants reporting.

Steel and copper or brass are the chief raw materials used. The chief source of steel is more often reported to be outside of New England than it is within this area, while copper and brass are almost always procured locally.

Methods of Paying Wages

AN incentive method is used in the payment of an average of 34 per cent of the factory workers. Although wage payment by the hour or day is the method in general use among electrical equipment manufacturers, 39 per cent of these New England companies use some method of payment on a piecework or other incentive basis. The proportion of workers affected by such systems varies among the individual plants from 20 to 100 per cent, with an average for the group of 56 per cent. Including those factories which have no such method of payment, the group average is lowered to 34 per cent.

Seasonal demand has little effect on electrical manufacturing in New England. The trend of seasonal fluctuation may be determined by the average number of workers on the combined payrolls of representative companies reporting for quarterly periods during 1923 and 1925:

Month	1923	1925
January	27,890	25,669
April	28,774	26,094
July	28,767	26,559
October	27,314	28,608

The month of maximum and minimum employment is different in each year, showing how little the industry depends on seasonal demand. Furthermore, the minimum number of employees formed 90 per cent of the maximum number in 1925 and 95 per cent in 1923.

An occasional slack period is used in several plants by the manufacture of radio apparatus, or by making up for stock. Manufacturers of incandescent or other lamps report a slight drop in orders in the summer months during which lamps are made up for stock.

Importance of Improvements Shown

THE importance of improvements in manufacturing practice made by these companies is determined by the number reporting that such improvements have been made. Those reported most frequently, with the number of manufacturers reporting each, are as follows:

Production control, 30; accident prevention, 29; organization and executive control, 27; continuous maintenance of plant and equipment, 24; standardization of product, 24; relations between management and workers, 22; inspection, 21.

Important results of such improvements have been described briefly by individual manufacturers as follows:

"Higher grade of manufactured goods."

"Increased output. Decreased payroll."

"Piecework method has developed increased production, with higher wages to individual and lower costs to company."

"Cost reduction by use of up-to-date equipment and efficient organization."

"Increased plant capacity over 100 per cent through the combined improvements."

Total sales have increased 95 per cent since 1921. The general trend of the combined total sales of these representative New England companies has been decidedly upward since 1921, with a large increase each year. A downward trend in total sales during the last few years is reported by 15 per cent of these companies. A change in the nature of the demand is the chief reason given for such decreases by manufacturers of lighting fixtures, switchboards and electric railway supplies who feel the competition of buses. Increases in demand have been aided by new products, new sales methods, the extension of territory, and lower production costs.

Twenty-eight per cent of total sales are made within New England, which is the major market for only 17 per cent of these companies. The proportion of New England sales to total sales ranges among individual plants from 1 per cent to 100 per cent, with an average for the group of 28 per cent. The proportion of total sales made within New England is high in Massachusetts, 39 per cent, and low in Connecticut, 13 per cent.

New England sales are also reported to be increasing by over 80 per cent of these companies. The few which report decreasing sales in New England account for it by the moving of factories to the West, the transfer of their sales activity to industrial centers of the West, and the decrease in street railways.

Causes Behind Larger Sales

INCREASED sales in New England are explained by better quality, more building and sales effort. One company which has experienced declining total sales has increased sales in New England by "better sales representation," while another manufacturer reports that New England sales have been increased 200 per cent by sales effort.

An average of 72 per cent of the output is branded. The use of a brand or trademark is reported by 80 per cent of these companies. The proportion of output which bears the brand ranges among individual companies from 5 per cent to 100 per cent, with an average for the group of 87 per cent. The entire output of two-thirds of these companies bears the mark of identification.

Advertising is used by 83 per cent of these companies. Of the large proportion of companies which advertise, 82 per cent advertise nationally and 18 per cent locally. The various media used, with the number of manufacturers reporting each, is shown as follows: business papers, 31; direct mail, 21; dealer helps, 18; magazines, 11; billboards, 5; newspapers, 4.

The total amount of expenditures for advertising by these New England companies equaled 2 per cent of the total value of products in 1925. Selling cost, exclusive of advertising, equaled 12.7 per cent of the value of product.

Methods of Distribution Used

THROUGH wholesalers or jobbers and direct to the consumer are the chief methods of distribution used. The various channels of distribution used by New England electrical manufacturers, with the numbers reporting each, follow: through wholesalers or jobbers, 31; direct to the consumer, 23; through a commission agent, 12; direct to the retailer, 8; exclusive distributors, 2; direct by mail, 1.

Export business is carried on by 44 per cent of the electrical manufacturing companies in New England. Export sales in 1925 formed from 1 to 10 per cent of the total sales from the individual plants, with an average for the group of 6 per cent.

The principal products of electrical machinery, apparatus and supply manufacturing concerns in New England, stated by groups, follow:

Generating apparatus and parts and automotive starter motors; transformers, induction voltage regulators, current limiting reactors, and converting and control apparatus; motors (not including controllers nor automotive starters), parts and supplies; batteries, parts and supplies; incandescent lamps and vacuum tubes; telephone, radio, telegraph and fire-alarm apparatus; industrial and household apparatus and appliances; electric measuring instruments, relays, and instrument transformers; switchboards, panel boards, cabinets, circuit breakers and switches; ignition apparatus for internal combustion engines; insulated wire and cable.

Principles *of* BUSINESS CONDUCT

Suggestions on competitive bidding, relations of manufacturers to each other, to customers, agents, and others, are approved by the National Electrical Manufacturing Association

Foreword

THE "Principles of Business Conduct" is the result of a study of many codes of ethics that have been adopted by many lines of business, supplemented by helpful suggestions from our membership.

The name, "Principles of Business Conduct," and the first section, designated "General Principles," was adopted *in toto* from the code developed and adopted by the Chamber of Commerce of the United States, to which organization we make proper acknowledgment. These General Principles are basic and broad, and apply with equal force to business of every nature and kind.

The succeeding sections deal more intimately and specifically with phases of the electrical manufacturing industry in which our members are directly interested.

Principles of Business Conduct

General Principles

THE function of business is to provide for the material needs of mankind, and to increase the wealth of the world and the value and happiness of life. In order to perform its function it must offer a sufficient opportunity for gain to compensate individuals who assume its risks, but the motives which lead individuals to engage in business are not to be confused with the function of business itself. When business enterprise is successfully carried on with constant and efficient endeavor to reduce the costs of production and distribution, to improve the quality of its products, and to give fair treatment to customers, capital, management, and labor, it renders public service of the highest value.

We believe the expression of principles drawn from these fundamental truths will furnish practical guides for the conduct of business as a whole and for each individual enterprise.

1. *The Foundation* of business is confidence, which springs from integrity, fair dealing, efficient service, and mutual benefit.

2. *The Reward* of business for service rendered is a fair profit plus a safe reserve, commensurate with risks involved and foresight exercised.

3. *Equitable Consideration* is due in business alike to capital, management, employees, and the public.

4. *Knowledge*—thorough and specific—an unceasing study of the facts and forces affecting a business enterprise are essential to a lasting individual success and to efficient service to the public.

5. *Permanency* and continuity of service are basic aims of business, that knowledge gained may be fully utilized, that confidence may be established and efficiency increased.

6. *Obligations* to itself and society prompt business unceasingly to strive toward continuity of operation, bettering conditions of employment, and increasing the efficiency and opportunities of individual employees.

7. *Contracts* and undertakings, written or oral, are to be performed in letter and in spirit. Changed conditions do not justify their cancellation without mutual consent.

8. *Representation* of goods and services should be truthfully made and scrupulously fulfilled.

9. *Waste* in any form of capital, labor, services, materials, or natural resources—is intolerable, and constant effort will be made toward its elimination.

10. *Excesses* of every nature—inflation of credit, over-expansion, over-buying, over-stimulation of sales—which create artificial conditions and produce crises and depressions, are condemned.

11. *Unfair Competition*, embracing all acts characterized by bad faith, deception, fraud, or oppression, including commercial bribery, is wasteful, despicable, and a public wrong. Business will rely for its success on the excellence of its own service.

12. *Controversies* will, where possible, be adjusted by voluntary agreement or impartial arbitration.

13. *Corporate Forms* do not absolve from or alter the moral obligations of individuals. Responsibilities will be as courageously and conscientiously discharged by those acting in representative capacities as when acting for themselves.

14. *Lawful Co-operation* among business men and in useful business organizations in support of these principles of business conduct is commended.

15. *Business* should render restrictive legislation unnecessary through so conducting itself as to deserve and inspire public confidence.

FOR many months the Nema committee on code of ethics and sound merchandising principles studied various codes in an effort to clarify the subject of wise business practices and principles which might be recommended to its membership as a practical guide. The subject was one of the main themes discussed at the recent meeting of the Policies Division in Chicago. N. A. Wolcott, chairman of the committee, presented as his report the code published herewith. It was adopted by the Nema Board of Governors at the Chicago meeting on March 15, 1928.

Competitive Bidding

1. The electrical manufacturers endorse the principle of a one-price policy.

2. A request for competitive prices on the part of a buyer involves definite obligations towards all bidders. The electrical manufacturers endorse as in the interest of sound, ethical and economic relations between buyer and seller the following principles to apply to competitive bidding under any specific inquiry:

a. That the bids be considered as confidential information between buyer and bidder until all bids are in and the buyer has placed the business.

b. That bidders exchange, where practicable, full information regarding their bids after the business is placed.

3. Where specifications call for various items involving different types and classes of apparatus, the relative merit of the different bids is best determined and freedom of choice on the part of the buyer promoted if each bidder quotes segregated prices at which any individual item would be accepted.

The Relations of Manufacturers to Customers, Agents or Others

1. Commissions should not be paid to consulting engineers or others receiving compensation directly or indirectly from the person or corporation for whose use the apparatus is being purchased.

2. Electrical manufacturers should not absorb losses due to mistakes made by customers or their representatives.

3. The manufacturer should not seek to reopen contracts already closed or cause the buyer to feel dissatisfied with his decision.

4. The manufacturer should not pay for catalog space, but it is proper for him to furnish information and electrotypes.

5. Efficient market development of the Electrical Industry requires the coordination of promotional activities in all of its branches. The electrical manufacturers endorse the collection and disbursement of funds and the control of all promotional activities in accordance with a unified plan and by an agency acceptable to the major branches of the industry.

6. The condition of shopworn or otherwise depreciated products, sold at reduced prices, should be indicated on the invoice.

N. A. Wolcott

Chairman, Nema Committee on Code of Ethics and Sound Merchandising Principles

Relation of Manufacturers to Each Other

1. The manufacturer's salesmen should be persons of known high character. Their reports should be based only on the facts surrounding the transaction or condition in question.

2. Comparisons favorable to one's own product are justifiable if they are confined to strictly truthful statements. But neither generally nor specifically disparaging statements concerning a manufacturer or his product should be made beyond those involved in a clear-cut comparison of similar facts. It is proper to make comparison of one's product with that of a competitor when such comparison is based on information secured through bulletins available to the public, articles appearing in the public press, information derived from the reports of competent, independent testing organizations, or upon data which can be readily verified by the prospective purchaser, such, for instance, as weights and dimensions.

3. It is often difficult to distinguish between failures of apparatus by reason of defects in workmanship or design, and those due to other causes; for example, abuse or misapplication on the part of the customer. Therefore, it is not ethical to draw the attention of a purchaser to the supposed failure of a competitor's line or type of product even although occasional instances of such apparent failure may have been reported.

4. Rumors concerning the financial standing or credit of a competitor or in general any rumor disparaging to a competitor should not be repeated.

5. Calling attention to the respective prominence and magnitude of manufacture is proper. This is advantageous to the smaller manufacturers in some cases and to the larger manufacturers in others, depending on the locality, size or equipment produced, or character of installations made, or possibly to the special peculiarities of relationship of the customer to the manufacturer or to his own trade.

6. As a matter of courtesy, one manufacturer should not endeavor to secure the employees of another without first notifying him.

7. The electrical manufacturers endorse the development of standardization of their products and urge all to conform to the minimum standards recommended.

International Association of Inspectors Is Planned

MEETINGS were held in New York in the middle of February to discuss plans which have been made for the formation of an International Association of Electrical Inspectors with an organization very similar to that of the Association of Electragists, International. The new association will become effective on Oct. 1, 1928, when the first meeting of the executive council will be held, and there will be about six geographical sections so that members can easily attend the regional meetings.

The objects of the association have been expressed as follows: "To cooperate in the formulation of standards for the safe installation and use of electrical materials, devices and appliances. To promote the uniform understanding and application of the National Electric Code. To secure and promote uniform administrative ordinances and inspection methods. To collect and disseminate information relative to the safe use of electricity. To represent the electrical inspectors in all matters which are dealt with nationally. To cooperate with other national and international organizations in furthering the development of the electrical industry. To promote closer cooperation between inspectors, inspection departments, the electrical industry and the public."

Membership will probably be divided into three classes: active (including electrical inspectors), associate (including anyone interested in the association who is not an inspector), and cooperating (including persons and organizations wanting to support the association with money), and it has been proposed that the field secretary of the National Fire Protection Association shall also hold the position of field secretary to the international Association of Electrical Inspectors.

CHAIN STORES *Not* ADAPTED to Sale of Electrical Goods

They give the manufacturer little or no sales co-operation, will not maintain outside salesmen, and are not inclined to handle partial payment business nor to service appliances. Distribution is better through dealers and dealer-contractors

BY JOHN ALLEN MURPHY
Marketing Counsellor

CHAIN-STORE systems had their biggest year in 1927. Last year, the number of chain stores increased by several thousand. The business that the systems did increased by hundreds of millions of dollars. The chain store idea of merchandising became more strongly entrenched. Pessimism as to the future of the independent merchant became more pronounced.

While the chains have met with the most success in retailing five and ten cent and variety goods, groceries, drugs, cigars, department store lines, men's clothing, shoes, candy and in dispensing food in public eating places, still it would be almost impossible to find a line of goods that is not sold through chains.

Specialization has been carried as far in chain merchandising as it has in any other branch of retailing. As a result, we find chains devoted to paints, upholstery, orange juice, beauty parlors, sporting goods, nuts, fountain pens, etc. And where an article hasn't a chain of its own, it is sure to be sold in some other kind of a chain.

Thus it is quite evident that the chain-store system of retailing has arrived at a stage of development where the manufacturer must seriously reckon with it. This applies to the electrical manufacturer as well as to those in other fields. Not only are there chains dealing exclusively in electrical merchandise, but quite a generous sprinkling of electrical articles can be found in chain stores in other fields.

To what extent has the chain advanced into the electrical industry? Are chain store methods adapted to the selling of electrical goods? Does the chain store operator make a satisfactory distributor for the electrical manufacturer? Do the chains menace the welfare of the independent merchant dealing in electrical wares? What has happened, both to manufacturers and their dealers, in those fields where the chains are most strongly entrenched?

These questions are not difficult to answer. Fortunately, the chain system of retailing has not made the progress in the electrical business that it has made in other fields. And at the same time it has made enough headway to enable us to size up its shortcomings and its potentialities.

The chain-store systems that are in the electrical industry are not like other chain enterprises. It is true that they have regular retail stores in which goods are offered for sale. However, these stores do not pretend to carry a full line of electrical appliances. Most of them carry only a few specialities—in some instances only two or three items. For instance, the Service Appliance Company handles only the Eureka vacuum cleaner and the Cass washer. Chains, such as Judson C. Burns, Inc., carry several specialities but their lines are not complete enough to justify one in calling them full-fledged electrical merchandise stores.

The greatest difference between these electrical chains and rgular chain systems is that the former do most of their selling outside of their stores. They employ large crews of salesmen who canvass the households of the surrounding community. The stores do little more than serve as demonstration and display headquarters for the salesmen. The stores initiate comparatively few sales. Most of their sales result from prospects that the salesmen are able to bring in.

When I looked into the business of the Service Appliance Company recently, it had 300 stores, located in New York and in surrounding States. At that time, it had more than 2000 salesmen working out of these stores. The stores are small and unpretentious. It is an advantage, however, for the outside salesmen to be able to refer their prospects to a company store in the community and perhaps to be able to make an appointment to meet the prospect at the store and

Any line of merchandise that requires intensive selling is not suitable for chain stores. The chains flourish only in fields where the goods sell on sight. They deal most successfully in shopping goods and in staples that people buy every day

there show her the different models of the appliance in which she is interested.

Also, the fact that the company has a store in each community where it operates, makes it a part of the local business life. It thus becomes one of the town's businesses and cannot be regarded as solely an outside organization that has come into the neighborhood only for the purpose of selling. Therefore, by having a chain of stores backing up its field force, the company overcomes the objection to house-to-house selling that so strongly exists in many parts of the country, particularly where the canvassers are representing a concern that does not maintain a branch in the community.

Chains of the Judson C. Burns type differ from that of the Service Appliance Company inasmuch as they are usually pretty much concentrated in one city and its suburban satellites. But even these stores depend very largely on their outside salesmen. It is claimed that this is the only way that chains in this industry can be successfully operated. It still requires intensive selling to market most electrical appliances. People appreciate the utility of such articles, but for some reason they do not buy them until urgently solicited by a salesman.

One of the largest vacuum cleaner manufacturers tells me that only three per cent of his output is sold in the stores of his dealers without the intercession of outside salesmen. Fifty-five per cent of this company's sales are made by salesmen without any assistance from the stores whatever. Forty-two per cent of the organization's sales are made through the joint efforts of outside salesmen and dealers. That is, the salesmen succeed in getting their prospects to visit a store and there the sale is closed.

Since this combination store-and-salesmen scheme seems to work so well in this industry, it is often wondered why the companies operating this way do not carry a larger variety of electrical goods. If an outside salesman can sell washers, vacuum cleaners and electric refrigerators for a store, couldn't he sell a full line of electrical specialties in the same manner? No, he could not. The number of items that a house-to-house salesman can successfully offer is drastically limited. The salesman finds it difficult to see his prospects. When he does get an interview, he has to make hay while the sun shines. The best he can do is to talk one item and talk it hard, during the few fleeting seconds that he is permitted to give his canvass. If he were to scatter his effort over a large line, he would get nowhere.

Pick Specialties That Bring Profits

SINCE it is advisable to concentrate on a few specialties, most merchants in this field wisely choose to stick to articles that run into money. As long as it requires intensive selling to dispose of an appliance, the salesman might as well be devoting himself to an article whose sale will be worth his effort. That is why the merchants in this industry favor vacuum cleaners, washers, ironers, radios, oil furnaces and other high-value appliances.

From time to time, an electrical goods dealer or a dealer-contractor meets with such success in handling a general line of electrical goods that he decides to expand his business into a small chain. Invariably these ventures fail. Either the merchant goes back to his single store or he throws out his general line and confines himself to three or four articles that can be successfully sold by outside salesmen.

Thus we see that the chain-store system of merchandising, as used in other retail fields, does not appear to be adapted to the electrical goods business. Seemingly the only way the electrical chain can be maintained, is by having outside salesmen support it. And when that plan is followed, such a radical departure is being made from customary chain store methods, that the company using such a plan could hardly be called a typical chain. In fact, strictly speaking, it is not a retail store organization at all. It is really a specialty selling business.

Any line of merchandise that requires intensive selling is not suitable for chain stores. The chains flourish only in fields where the goods sell on sight. They deal most successfully in shopping goods and in staples that people buy every day, such as groceries and tobacco. If an article needs any special selling effort, other than an inviting display, it cannot be satisfactorily distributed through chain stores.

Neither do chain stores function well in those lines where installment selling prevails. For the most part, the chains do a strictly cash business. Where they extend credit to selected customers, it is only for thirty days. They do not go in for merchandise that has to be sold on the deferred payment plan. This is another factor that tends to keep chains from entering the electrical goods business.

JOHN ALLEN MURPHY, now marketing counsellor, was for a number of years associate editor of *Printers' Ink*. His long service in that position brought him into frequent contact with all phases of American business and permitted him to study them from a wholly impartial point of view. What he has to say here about chain store distribution is based on that experience and on special research made for ELECTRICAL MANUFACTURING. If the reader does not agree with the conclusions reached in this article, he is invited to write to the editor and tell why.

THE EDITOR

Of course, as soon as an electrical item becomes a staple, and moves off dealers' counters without any special salesmanship, it becomes eligible for chain store distribution. There are already many articles of this type in the electrical business, and the number is constantly increasing.

The five and ten cent chains sell large quantities of sockets, plugs, receptacles, cords, caps, switches, small flashlight batteries, percolator glass tops and numerous other devices. They also handle radio parts. At one time they did an enormous radio business.

Electrical Goods Sold by Chains

THE variety chains, handling up-to-a-dollar merchandise, feature Mazda lamps. The National Lamp Works claims that "two thousand chain stores sell millions of National Mazda lamps per year." The same company further advertises that "experience shows that any chain store can and should do one per cent of its gross business on Mazda lamps. If you are doing less than one per cent you are getting less than your share of Mazda lamp sales."

Since Mazda lamps are sold on the consignment plan and in that way are price-protected, the chain's customary price-cutting proclivities is not a source of trouble to the lamp companies. In fact, the chains are giving the lamp manufacturers such whole-hearted cooperation that, today, the chains are regarded as one of the largest and most satisfactory distributors of lamps.

The drug store chains sell a considerable quantity of vibrators, violet ray outfits, warming pads, and other pharmaceutical appliances. Many of them also handle toasters, electric fans, electric heaters, and similar articles. As a rule, though, the drug chains do not offer severe competition on these items. They regard electrical appliances, especially those having a pharmaceutical purpose, as giving them an opportunity to make up for the articles that they do sell at cut prices.

There are a number of department stores in the United States that are affiliated in chain combinations or in buying associations. Most of them are small. As a general thing,

there are not more than twenty-five or thirty units in the organization. The only large department store chain in this country is that of the J. C. Penney Company. This company has 1000 stores. But, fortunately, this concern does not carry electrical merchandise of any kind.

Objections to Chain Stores

OF course, many department stores stock electrical goods in several departments. And when such stores unite into chains, they enter the class of the distributing organization being considered in this article. Big as these stores are, they are not regarded as a distributing factor in the electrical industry. It is true that they sell a goodly quantity of vacuum cleaners, toasters, percolators, sewing machines, floor polishers, irons, lamps, and numbers of other items of an electrical nature, but the department store is seriously handicapped in handling such merchandise. The department store deals mostly in shopping and style goods. Articles that need the bull-dog type of selling, such as we have already seen many electrical articles require, do not attain a large volume of sale in these stores, unless the store is equipped with a force of outside salesmen, and few department stores have an outside sales organization.

That about sums up the story of chain store distribution, as it would interest the manufacturer of electrical goods. We must concede that the chain store is an important factor in retailing electrical merchandise, but it is by no means a dominant factor. Except on a few items, such as lamps, radio parts and therapeutical appliances, the producer of electrical goods could get along very nicely without selling the chains at all.

At best the chains are not satisfactory distributors. There are several principal objections to them:

(1) They cut prices.
(2) They buy direct and thus interfere with any arrangements the manufacturer may have with jobbers or special distributors.
(3) In most instances they give no service to their customers.
(4) They give the manufacturer practically no sales cooperation.

In some lines, these objections may not be serious. In the grocery trade, for instance, the chains have thoroughly established themselves and are rapidly becoming the dominating factor in the distribution of food.

In the electrical industry, however, the objections that I recapitulated are vital. The industry is in no position to withstand a devastating campaign of price-cutting. There are hundreds of different items in the electrical business. It is manifestly impossible for the dealer to buy all of these articles direct from the manufacturer. He has to buy from the jobber. The jobber, or the special distributor, therefore, is the keystone of the distribution system in the electrical industry. It would be unfortunate if the inroads of the chains into this industry should menace the welfare of the wholesaler.

Another reason why the jobber is so important in this industry is because the bigger end of the output of electrical manufacturers is not offered for resale by retailers. It is used either by the contractor in his work or it is consumed by the industries.

One of the largest wholesalers of electrical merchandise does an annual business in excess of sixty million dollars. Less than twenty-five per cent of this huge volume is resold by retailers. A large part of this concern's sales is to big industrial buyers, such as railroads, steel companies, construction companies, etc. The average manufacturer of an electrical product would not be in position to sell these miscellaneous industrial buyers direct. To get this business, he must distribute through a wholesaler.

Lack of Service and Cooperation

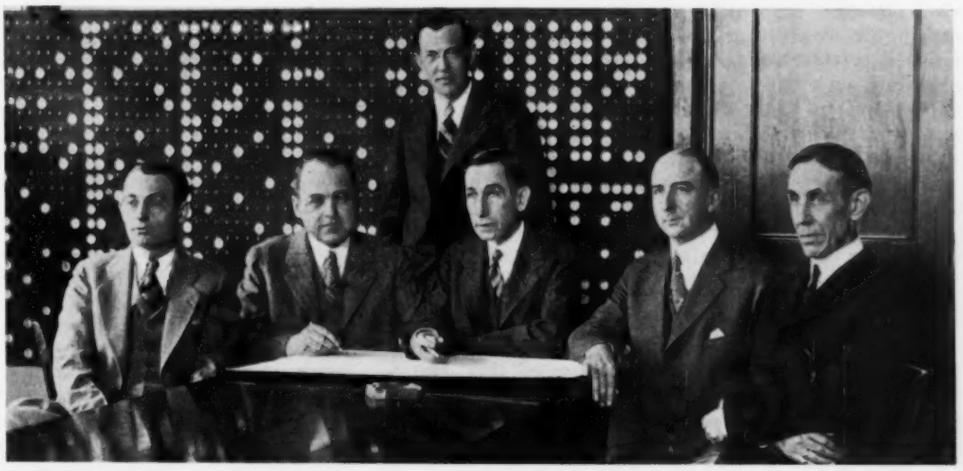
THE fact that the chains do not give service to their customers is another objection to them that almost eliminates them from consideration by the electrical manufacturer. The retailer of electrical goods must give service. This is one line of merchandise that absolutely requires expert knowledge on the part of the dealer. The untrained clerk that the chains employ is totally unqualified to sell electrical goods.

That the chains give the manufacturer little or no sales cooperation is the most serious objection to them, from the viewpoint of the maker of electrical articles. I have already explained that it is difficult to sell most high-value electrical appliances unless they are offered by a most capable salesman.

When an electrical article becomes a staple, is in everyday demand and sells on sight, it can be sold by chain stores. But until his product enters this class, the electrical manufacturer had better confine its distribution to independent dealers and to dealer-contractors, who are capable of putting the high-power selling effort behind the article that it must have to become a "best seller" in this peculiar trade, and who are equipped to install the article properly and see that it continues to give satisfaction to its owner.

Men Whose Decisions Affect Radio Manufacturers

The decisions of the Federal Radio Commission, whose members are shown here at a recent meeting in Washington, will indirectly influence production and distribution in the radio field. From left to right are Sam Pickard, O. H. Caldwell, Judge Eugene O. Sykes, H. A. LaFount, Judge Ira E. Robinson and C. H. Dutman, secretary, who is standing in the center. Judge Sykes is acting chairman



Station G-A-G-E, *Editor Speaking*

Stanley A. Dennis, Editor and Assistant to the President

Where Does Manufacturing Begin?

YEARS of hard-earned experience and countless business failures seem necessary to teach business to know where manufacturing really begins. New and old manufacturers alike seem to find it difficult to break away from the point of view that a manufacturing business logically develops along the following lines: get a patent, find some money, buy a site, build a factory, put in machinery, hire operatives, and then sell the product. Perhaps this point of view is an inheritance from the handicraft age when demand far outstripped production, when goods were consumed faster than hands could make them, when many products more readily found a market than they do now. If any evidence were needed to substantiate the fallacy of this point of view with reference to manufacturing today, it can be found in the hundreds of silent and deserted factory buildings that line the railroads and highways of America.

That point of view may have been logical at one time. Certainly it is not so at present. Mass production is an old acquaintance now, and mass distribution has recently come to stay. If this means anything at all, it means that manufacturing thinking and planning and executing begin with the market and not with a patent. The initial questions are: what does the market buy, what can it be persuaded to buy, how much will it buy, what will it pay, how can the product be serviced and kept in use? And when these questions have received working answers, then begins the planning of the manufacturing business. In this sense, marketing precedes production. A thousand and one market considerations govern the kind of product to be made, how much money is to be invested in its making, where it is to be made and when, and in what quantity.

If evidence is necessary to substantiate the validity of this new point of view, it can be found in the success of such concerns as the Ford and General Motors companies and a score of lesser concerns that have found out just where manufacturing does begin. Their success lies in the fact that they have discovered that a manufacturing business is built backward, if you will, backward from the consumer to the patent rather than in the reverse order. It is said that in the case of the two companies named there are materials that never stop moving from the time that processing begins until the finished product rolls into the garage of the consumer. Certainly such business success can only be built on an expert and up-to-the-minute knowledge of the market and on a superb selling organization which can move goods as fast as they are made.

One wonders sometimes when reading of the failure of a concern once thriving with the manufacture of electrical products whether the owners or executives were guilty of trying to drive the cart before the horse.

Vision of the Pioneer

FORTY-FIVE years have passed since that historic day in 1882 when Thomas A. Edison opened the Pearl Street station, New York, the first station in the world for the production and distribution of electric light and power. Writing of that occasion, in a foreward to Ernest Greenwood's new book, "Aladdin U. S. A.", Mr. Edison says:

"It meant the end of the candle and oil lamp and gas lamp, the end of the horse and carriage, the end of one epoch in civilized life and the beginning of another. I was a young man then. I am an old man now. I have lived to see the street car, the elevator, the electrified railroad, the automobile, the phonograph, the motion pictures the radio, the airplane, and the beginnings of television. It seems today to many as it seemed to most men and women in 1882, that no great forward steps remain to be taken which are comparable to those that have been taken.—But of one thing I am more positive than I was even forty years ago—the electrical development of America has only well begun. So long as there remains a single task being done by men or women which electricity could do as well, so long will that development be incomplete."

When one reads these words, he is tempted to stand silent in profound respect and admiration for the vision of the pioneer. Forty-five years of toil have not cooled the spirit of this grand old man. Forty-five years of infinite experimentation in laboratory and workshop and factory have not dimmed the faith of this pioneer in ideas and ideals to which he has given his life. Forty-five years of ceaseless struggle to harness the forces of Nature in the service of mankind have not impaired his mental strength nor dimmed his vision. With an amazing record of achievement behind him, he has the sublime courage to say, "The electrical development of America has only well begun."

Someone has said that the greatest loss to American business is the experience of the business pioneer who passes on. And yet one can name a greater loss. It is the loss of vision, the loss of the faith, without which achievement itself is impossible, without which there is no experience. An ancient prophet declared, "Where there is no vision, the people perish." And what he said holds true for the electrical manufacturing industry today.

Someone, somewhere, must catch the vision of Mr. Edison, a vision that will carry the industry on to still greater achievement. He says, "I was a young man then. I am an old man now." One wonders whether, in some secluded workshop or in a crowded electrical factory, there is now a young man on whose shoulders may fall some day (pray a distant one) the mantle of Thomas A. Edison, whose eyes shall catch his vision and make it real, and whose mind shall dream dreams and then forge them into actualities.

He Has a Place in the Sun

IN these times of "consolidations" and "chains" and "mergers," one is easily tempted to think that the days of the small electrical manufacturer are numbered. Almost every month brings the news of the sale of a manufacturing business of long standing or its disappearance with other concerns under a new and unfamiliar name. Ever the "big fellows" seem to grow larger and larger and the "little fellows" fewer and fewer.

And yet, is it really so? Larger concerns "pass out" now and then. Smaller concerns are with us year after

year. New concerns start in business almost daily. And the list of moderate sized manufacturing concerns that forge on, year after year yielding substantial profits for their owners, is a long one.

Assuming that the small concern has only a small chance is merely lazy thinking. Every executive who has found it necessary to compete with the "big fellow" has learned sooner or later that when all is said and done he is competing chiefly with only one department and often with only a single executive in the big concern. And he has discovered, too, that often he can "think circles around" the supposedly big fellow—and win out. As George E. Roberts, vice-president of the National City Bank of New York, points out in his message on "Competition and the Small Manufacturer" in this issue of Electrical Manufacturing, bigness has certain big liabilities as well as the more readily recognized assets. In an ever-increasing market, such as that which confronts the electrical manufacturer to day, the small manufacturer has a wide opportunity which he may capitalize to his advantage if he will.

Establishing Business Ethics

WHEN speaking by radio not long ago on the subject of character as the foundation of successful business, John D. Rockefeller, Jr., said:

"Today the vital matter to which business must needs address itself is the re-emphasizing of character and of high standards of business ethics, for upon such a foundation only can business be permanently successful."

Perhaps no more fitting words than these could be found to express the spirit which has prompted the National Electrical Manufacturers Association to indorse a code of business conduct. It is significant of the progressive spirit of this association that at the very time that Mr. Rockefeller's words were still fresh in the minds of his hearers, the special Nema committee on a code of ethics and sound merchandising principles was completing its work preparatory to presenting its report at the recent Chicago meeting of the Policies Division. At this meeting the code was approved by the division and was later endorsed by the board of governors. It is published in full elsewhere in this issue of Electrical Manufacturing.

The code opens with a declaration of business principles which has been adopted by the Chamber of Commerce of the United States and many business organizations throughout the country. In accepting these principles Nema puts itself squarely in line with the best thought in American business today. Other portions of the code deal with the troublesome question of competitive bidding, relations of manufacturers to agents, customers and others, and relations of manufacturers to each other.

It is not to be expected, of course, that all electrical manufacturers will agree with the new Nema code. It is possible, even, that a Nema member can be found here or there who may wish that certain of its provisions were different from what they are. Be that as it may, the code is the strongest declaration of its kind that has yet come from the electrical manufacturers as a group. It deserves the thoughtful study of member and non-member alike. Certainly it will be respected by Nema and it may be expected to exert a powerful influence working for better conditions not only among the electrical manufacturers themselves but also among other groups in the industry. The adoption of such a code is another bit of evidence proving the ability of American business to govern itself wisely.

Stanley A. Dennis

I take pleasure in announcing the appointment of Stanley A. Dennis as editor of Electrical Manufacturing, *not only because of his long editorial service to the electrical industry during which he has always been in touch with problems of the electrical manufacturer, but also because of his background in other fields of business. He was formerly the director of the bureau of business standards of* System (*now The Magazine of Business*) *and* Factory (*now Factory and Industrial Management*), *and was one of the editors of various books on factory management published by the A. W. Shaw Company. He is also editor of* Electrical Record.

N. W. Gage
President, Gage Publishing Company, Inc.

Price Integrity

WHOEVER listens closely to the voices of American business knows that a tide of protest is steadily rising against price cutting. Almost every convention is marked by declarations against this ancient evil. Newspapers and magazines carry discussions of it. Books on the subject are published in increasing number. And by radio the discussion is carried into the home and to the consumer, the consumer who is always the victim of price cutting.

Sound business management has long been aware of the ultimately disastrous results of a price-cutting policy on a long established business. Gradually the public is awaking to the fact that the price-cutting retailer may give you something with one hand while you are looking but that he takes a lot from you with the other hand when your back is turned. In other words the public is waking up to the fact that price cutting is nothing more or less than a shell game. Sooner or later sound business and enlightened public opinion may be expected to measure out the same punishment to the price cutter that it metes out to perpetrators or other forms of commercial fraud. Federal legislation to that effect is now pending.

Price maintenance is, of course, what is needed to protect both business and the public. In this connection, Senator Arthur Capper, a successful business man himself, suggests that the name price integrity be adopted as a more desirable term than price maintenance. His point seems well taken. It is to be expected that it will not be easy to persuade other legislators to change their thinking with reference to price integrity but economic progress and public welfare seem to demand that such a change be effected.

Are Your Foremen or Are They

Do you train them to keep in full, continuous flow, or do they obstruct daily

By Glenn L. Gardiner
Ward Leonard Electric Company

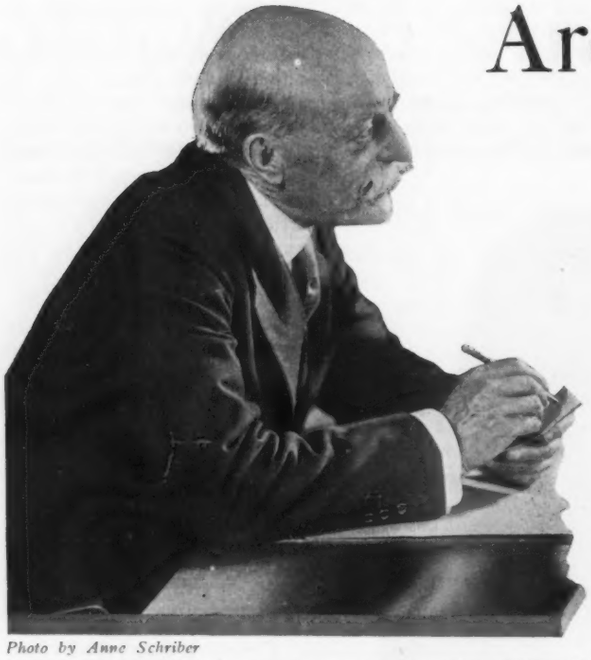


Photo by Anne Schriber

The man at the top who arranges group discussions among his foremen increases plant efficiency by enlarging their knowledge of management problems

"IF we can just get every foreman in our plant to looking at his department and its problems with the same attitude of mind that a plant manager looks at plant problems," the operating vice-president of a manufacturing plant told me not long ago, "we can have a *real manager* in every department." Many a managerial policy, or desire, has gone astray simply because the foremen of the organization functioned as "insulators" instead of good "conductors" when the policy got down to them.

It has been said, and accurately I believe, that the place where management's policies and viewpoints most often change color is in the foreman's interpretation of them to his men. If the top manager could just "listen in" on some of his own ideas when one of his foremen is trying to "put them across" to his men, many of them would not be recognizable as ever having originated with himself.

How futile it is to sweat and struggle in the development of sound, thoughtful policies and methods, only to have your foremen "gum up the works" when the time comes for them to carry the policies out! And whose fault is it—the foreman's or the management's?

Translating Policies into Action

IT has been remarked that "the average foreman is more apt to fail from lack of information than from lack of ability." For the most part, foremen are doing a pretty good job, considering the help they have had in a large proportion of manufacturing plants. Managers have often expected more of their foremen than they had a right to expect, considering the meager help their foremen have had from them in the development of the managerial side of their qualifications.

There is no more essential factor in making management's policies effective right on the job than that of intelligent foremanship—foremanship with a background of thorough understanding. The management must depend upon its foremen for the important task of actually translating policies into action in the plant. The foreman is in a position where he can represent or misrepresent the management, all depending upon his understanding of what is wanted by the management.

Management cannot expect its foremen to do any better job with workers than management does with its foremen. Foremen cannot intelligently represent the management to the workers until they themselves have had management intelligently represented to themselves.

This seems so obvious that one would expect every manager to spare no pains in the development of his foremen. On the contrary, managers too often allow their foremen to shift for themselves without undertaking any systematic, consistent program of keeping the managerial point of view before them.

Ask a few manufacturing executives what they are doing, or have done, to make *real managers* of their foremen. A typical answer will be, "Oh, I've got a handpicked bunch of foremen! Of course, I'm in pretty close touch with them. They all know that they can come to me for information. Whenever I've got any special idea I want to put across to them I call them together, or I drop in on them in their own departments."

Systematic Method Is Necessary

AND yet, if you get right next to that same executive's foremen, you are likely to find most of them bristling with unanswered questions as to "what the boss is driving at." Some will be "sitting on needles and pins" because they "can't dope out the boss." Some will be making half their decisions by guess and their own impressions instead of by facts which the management has never given them.

The average foreman needs a lot more information than he has, and his management is responsible for making it readily available to him. Management must go even further, and provide a regular plan for actually putting the information into the foreman's mind and getting him to make good use of it.

The electrical industry is among the most progressive industries of the country. This is probably due to the fact that it is a relatively young industry and does not have a lot of old traditions, habits and set practices to contend with. Furthermore, electrical science has been developing so rapidly that the industry has had to be progressive.

A number of electrical manufacturers have been among the pioneers in the field of foremanship development. Notable among these, for example, has been the Westinghouse Electric Manufacturing Company at East Pittsburgh. For several years it has been conducting an extensive program.

Companies that have put on effective foremanship development programs are ready to testify to numerous tangible

Good Conductors Insulators?

your managerial currents in shifting for themselves your policies and plans

GLENN L. GARDINER has served as foreman of apprentice molders in a malleable iron foundry, employment manager of the Samson tractor and Chevrolet divisions of General Motors Corporation. director of foremanship development of the Oakland division and foreman training in the University of Wisconsin Extenson Division. He is now doing special work for the Ward Leonard Electric Company

Photo by Anne Schriber

The foreman who knows all aspects of the problems of production is qualified to act with efficiency as a real manager of his particular department

evidences of increased productive efficiency, more intelligent interest in economical production, higher quality, greater interdepartmental cooperation, more effective supervision of labor, and more faithful representation of managerial policies.

How can a company set up an effective foremanship development program? What steps must be taken? Who should take them? What activities should be included in the program? What subject should be considered? Should the program be a temporary or a continuous function?

First Step Is Management's

SUPPOSE we discuss these questions, and then we will describe our foremanship development work here at the Ward Leonard Electric Company as a concrete illustration of a company program in actual operation.

The first step in setting up a company plan of foremanship training and development must be taken by the management. The management must be sold on the idea.

Many a foremanship development set-up has "flivvered" simply because the active support of the management "petered out" after the initial enthusiasm wore off. Not only must top management actively back the program, but everyone concerned in the organization must know that top management is vitally interested.

It is particularly important that the intermediate executives between the top management and the foremen be thoroughly sold on the idea. Unless the foreman's superintendent is in on it and pulling for it, the program is not likely to be taken as seriously as it should be by the foreman.

The responsibility for heading up the work must be delegated to some capable executive. In large organizations the full time of a foremanship development director can be very profitably devoted to the work. In smaller organizations it can be made the part time work of some capable executive above the rank of foreman.

The leadership of the program is the most important single factor in its continued success. The man in charge should be a man of sufficient experience, age and importance to command the respect of the foremen. On the other hand, there may be danger in using a high executive, or one in direct authority over the foremen. Such a leader may "freeze" the foremen—they may be backward about expressing themselves before him; or they may be guided in their expression by what they think will sound good to him.

It is now recognized that there is a continuous function to be performed in keeping foremen continuously and systematically informed as to company policies, plans, desires and projects. They must be constantly drilled in the latest developments in good management practice. The company itself is constantly confronted with new problems and situations resulting from the constant change in market, economic and competitive conditions, all of which are reflected in constantly changing operating policies within the plant. If management is to keep its plant administration in constant harmony with the conditions of the day, the foremen must be kept constantly informed and enlightened.

Foremanship development, then, is a continuous function. The managing executive of a company does not keep himself thoroughly informed and posted for two or three months out of the year and then run the plant by guess the other nine or ten months. Neither is it reasonable to expect a foreman to effectively manage his "business" within a business unless he is kept continuously supplied with up-to-the-minute facts, figures, policies and objectives.

The needs of the foremen, therefore, cannot be fulfilled by a short "course" in foremanship, nor by any spasmodic, hit-or-miss method of "getting them together once in a while" when there is something special to be put across.

Regular Meetings Are Effective

REGULAR group discussion meetings of foremen have been demonstrated to be the most valuable device for putting over the subject matter of a foremanship development program.

The foremen should be divided into small groups of from twelve to twenty men. The groups should be small enough so that the foremen will feel free to enter into discussion without stage fright or embarrassment. When more than twenty foremen are included in a discussion group there is a tendency for only the bolder members to do the talking.

The group should be large enough, however, so that group conclusions will carry convincing weight with individual members. When a group is composed of less than a dozen, it becomes a little too easy for one or two men to force their opinions on the entire group. Furthermore, in a very small group there may not be a wide enough total experience represented to make the conclusions arrived at authoritative.

The groups should meet at least once every other week,

but not oftener than once a week. If meetings are held less frequently than twice a month the program does not maintain continuity of interest. They cool off between shots. With meetings further apart there is not enough opportunity to cover the ground that should be covered. If meetings are held oftener than once a week the program is likely to become a burden to everybody. The foremen get "fed up" with it.

Companies which go after foremanship development seriously almost invariably feel that it is worth while to hold meetings during factory hours on company time. This immediately stamps the whole program with the management's unqualified approval. The men realize that the management must believe in it or they would not take working time for the meetings. They come to recognize it as a regular part of their work and duty.

It is very difficult to maintain continuous interest in a program carried on during the foremen's own time. They lose interest because they do not feel that the company is particularly interested. The meetings interfere with their recreation and with their home and family life.

Meeting in small groups composed of foremen drawn from all parts of the plant, no one part of the plant is entirely robbed of supervision at one time. Besides, any foreman with ability enough to justify his holding the job can so plan his work that he can be absent from his department for an hour or so once a week without seriously interfering with his work.

Glenn L. Gardner

Meetings lasting one hour have been found by the writer to be most effective. A meeting of that length need not tire anyone. It is better to have shorter meetings and make them interesting than to have long, dragged-out sessions. If the discussions are carefully planned a great deal can be covered in one hour.

The meeting place is important. It should be comfortable, light and well ventilated. If possible, meetings should be held in a place removed from the noise and distractions of the plant. Anything that divides the attention of the men is bound to detract from the effectiveness of the meetings. Comfortable chairs should be provided. It is desirable to have a meeting place where the men can smoke.

Time of Meetings Is Important

THE time of day and the day of the week are also important considerations. The early days of the week are usually preferred. Later, the men are getting tired out and may be thinking more about plans for the week-end than about other things. Meetings should be arranged at times of the day that interfere least with the foremen's work. Meetings should not be held for at least half an hour, or an hour, after starting work in the morning, or at noon. This time is usually needed by the foreman in his department to get everything properly underway. The meetings should be scheduled so that the foremen will not be taken away from their departments during the last half hour before closing at noon or at night. They should be on the job then.

The foreman is a mature man, and resents any insinuation that he needs schooling. The discussions must not be placed on a classroom basis. They should not be referred to as classes. Unless the discussions are well conducted the whole program will soon tumble.

At the very first meeting there should be established a clear understanding as to the function of the leader or chairman. We have already prescribed that the leader should be a man of experience and maturity, respected by the foremen. However, he should make it clear at the outset that he is not posing as any expert. He is not a teacher. He does not assume that he knows any more about foremanship than they do.

The leader who assumes to be able to answer all questions and solve all problems is licked before he starts. He should make it plain that he is merely going to act as a presiding member. When he has an idea to express he will shoot it into the discussion like anyone else, and let it stand on its merits.

Then the leader must stick to this. He must guard against monopolizing the discussion. By reason of his position as chairman it is very easy for him to have too much to say. He should remember that the more he talks the less the members of the group will talk. And the less they talk the less they will get out of the discussion.

The discussion method depends largely for its effectiveness upon the pooling of ideas. By bringing the total experience of the entire group to bear on a given problem, each member gets the benefit of scores of years of experience instead of just the limited experience of one man. If the leader does too much talking, the meetings will degenerate into lectures. In a lecture the only one who is doing active, constructive thinking is the lecturer himself.

The discussions should be conducted in a very informal manner. Every foreman should feel free to speak what is on his mind, and it should be understood that no one will be held accountable outside of the meeting for anything uttered in the meeting. It is up to the leader to maintain the right degree of informality. He should not be afraid to introduce humor and other devices to stimulate interest among the foremen present.

An effort should always be made to bring the discussion of each question to some sort of a conclusion which is agreeable to the majority. Unless conclusions are arrived at, there is a tendency on the part of members to feel that the discussions are not getting anywhere. One of the best ways to cure an offish foreman of eccentric ideas is to have him find that the rest of the foremen hold the opposite viewpoint. It is fairly safe to assume that the majority will line up on the right side of a question. But the leader must be careful not to influence the thinking and the conclusions of the group.

Properly conducted meetings can serve as an excellent clearing house for current management and operating problems as they apply to the foremen. The meetings can furnish an opportunity to constantly keep before the entire foremen organization the important goals and objectives toward which the company is striving. The meetings also furnish an opportunity for keeping in the forefront of the foremen's minds the best accepted principles and practices.

Conditions Govern the Topics

THE specific subject matter to be considered should be determined somewhat upon the particular conditions, problems, situations and policies of the particular company in question. In a general way the functions of foremen are the same in all plants.

We might classify the general functions of a foreman as follows: Handling men, getting out the work, maintaining quality, reducing cost and eliminating waste, carrying out management's policies, regulations and projects, looking after the safety of workers, breaking in new men.

When it comes to conducting a program in a given plant, the specific problems peculiar to the plant may be classified under these general functions. The order in which subject matter is presented will usually be determined by the timeliness. The time to put emphasis on the subject of quality

(*Continued on page* 50)

News of the Month

A department containing news of electrical manufacturers and also other news of the industry that may be of importance to them

Bryant Electric Buys Hemco

Arrangements have been made by the Bryant Electric Company, Bridgeport, Conn., to purchase the Hemco plant, trademark, patents and processes. The Bryant Electric Company has been making wiring devices for forty years. It is the oldest and largest company of its kind in the world. The Bryant Line consists of metal shell and porcelain lamp receptacles and sockets and their accessories, surface and flush switches, fuses and fuse holders, baseboard receptacles and plugs, rosettes, cord connectors, hospital signal equipment, and other devices.

The Hemco Electric Manufacturing Company has been in business as makers of molded sockets, molded plates and other composition parts for electrical purposes for many years. They are the originators of phenolic molded wiring devices.

It is the plan of the Bryant company to expand this line and develop many new composition devices, and it will maintain its present policy of distributing all of this material through jobbers. Stocks of Hemco material will be added to the Bryant stocks at Bridgeport, Chicago and San Francisco.

Cutter Electrical Renamed I-T-E Circuit Breaker

I-T-E Circuit Breaker Company is the new name of the Cutter Electrical & Manufacturing Company, 19th and Hamilton Streets, Philadelphia. The new name is that of the company's chief product, the I-T-E circuit breaker. The old name was of 40 years' standing.

Kettering Sees Large Refrigeration Market

"Less than 5 per cent of the prospects for electric refrigeration have been sold," said Charles F. Kettering, vice-president of General Motors Corporation, to 1300 Frigidaire salesmen at their regional convention dinner in the Hotel Astor, New York City.

C. F. Kettering

"By the time 20 per cent have been supplied, a sufficient number of new applications for electric refrigeration will be developed to again bring the existing market to its present size."

Twenty officials of the corporation conducted the regional meetings, carrying with them a large amount of scenery, stage equipment and a complete stage force. The same program was presented in each city.

Frigidaire's annual sales convention in past years brought 2500 salesmen to Dayton. The regional convention plan enables the corporation to contact with several thousand additional members of its selling organization.

Kirkland Makes 10,000 Mile Trip in Promoting Electrical Code

When Harry B. Kirkland told the NEMA Policies Division meeting at Chicago of his extended western, southwestern and southern trip, recently completed,

Harry Kirkland travels fast and far and gets things done, as everybody knows who knows Harry, but out in Portland, Ore., Eugene L. Knight, president of the Oregon Association of Electragists, persuaded him to stand still long enough for a snapshot. Harry seems to be fond of literature, judging by the quantity of reading matter pressed tenderly against his belt line

during which he carried the story of the National Electrical Code to eighteen large cities of that territory, he was describing not merely a trip but a significant milestone in the electrical industry. He was the first man to represent all branches of the industry on such a mission.

The great territory west of the Rocky Mountains affords fertile ground for the introduction of the Uniform Electrical Ordinance, and, according to Mr. Kirkland, who stressed the necessity for activities that will be state-wide in character to have the National Electrical Code established in all communities, "there is much room for work in the smaller cities, villages and townships between Los Angeles and San Francisco. The same conditions obtains in Oregon, Washington and Idaho and, for that matter, in Texas, and to bring the situation nearer home, there is much missionary work to be accomplished in Illinois.

Mr. Kirkland asserted that in many municipalities where utility and city officials were wont to point with pride to the high percentage of wired homes, the situation was in reality a high percentage of connected homes, and reinspection, as provided for in Section 6 of the Uniform Electrical Ordinance, would prove a lack of adequacy and improper wiring conditions.

Grigsby-Grunow Acquire Yellow Truck Plant

The Grigsby-Grunow Company (formerly Grigsby-Grunow-Hinds), makers of the Majestic line of radio products, has recently acquired the plant of the Yellow Truck & Coach Manufacturing Company in Chicago, Ill. This, combined with its original Chicago plant on Armitage Ave., makes it one of the largest radio manufacturing institutions in the world. An addition to the original plant, which doubles its facilities, has also been recently completed. This gives the company a floor space of a half million square feet, available for manufacturing.

Nema Policies Division Meets in Chicago

For the first time in Nema history, Chicago became host to the National Electrical Manufacturers Association, when members of the Policies Division of that organization met at the Edgewater Beach Hotel, March 14-16, for their annual spring meeting. Standards of business conduct, problems of distribution, terms of payment, labor, codes and ordinances, standards of performance, the tariff and electrical shows, were some of the subjects discussed at this meeting and formed the basis for action taken by the board of governors.

At the first general session, N. A. Wolcott, chairman of the Nema committee on code of ethics and sound merchandising principles, presented and explained a code of business conduct which was later indorsed by the governors. (It is published in full elsewhere in this issue of ELECTRICAL MANUFACTURING.)

Cash discounts aroused considerable discussion, and R. J. Russell's talk on "Terms of Payment" indicated that the membership realized the importance of improved credit methods. In the talk which followed, a number of members were of the opinion that the cash discount has no economic justification at the present time.

The importance and desirability of col-

lecting information on closed transactions was clearly indicated by a number of members of the division in their talks from the floor. It was emphasized at this time that the Nema office is now equipped to collect such information after the bids are closed.

At the second general session, W. S. Ruggs' paper on "Minimum Standards of Performance" provoked considerable support, and the division indorsed the adoption of minimum performance standards for electrical products.

Distribution received much attention at the second general session, and also at the Board of Governor's dinner. It was clear that the membership was interested in the effect of chain jobber competition, particularly in the handling of re-sale merchandise. In the discussion, the difficulty of getting hold of the problem was emphasized, and it was apparent that no study covering the entire industry would be applicable to its particular parts, but that the subject might be susceptible to study and analysis of product groups.

In this connection, H. B. Crouse said two questions required an answer: First, "What are you trying to distribute?" Second, "What is the most efficient and profitable volume for your business?" Others who discussed this question were George Hughes, A. L. Eustice and J. C. Belden.

A resolution passed by the labor committee was presented by S. L. Nicholson and was later approved by the Board of Governors. This resolution is as follows:

1. That you urge all members of NEMA not already members of the League for Industrial Rights, to immediately take out membership in that organization.
2. That all member companies having trouble with organized labor, insofar as it affects the free distribution of their products, at once notify the Labor Committee of NEMA for such action as may seem best, and that the matter may be brought to the attention of the other members of NEMA.
3. That our representatives on the Executive Committee of the N. E. L. A. lay before that committee the facts in reference to existing labor conditions and their effect upon the electrical industry.
4. That our representatives on the Board of Governors of the S. E. D. (which is the coordinating organization of the entire electrical industry) lay before that Board the facts in regard to existing labor conditions, discussing with such representatives from other branches of the electrical industry the situation in detail and its effects on restricting the development of the entire industry.
5. That the representatives of NEMA on the above organizations report back to the Board of Governors of NEMA for action at their next meeting.
6. Your Labor Committee believes that every right and proper step should be taken by NEMA to protect the electrical manufacturing industry in the unrestricted distribution of its goods so that an open and free market may be maintained.

Much work was accomplished by the members of the motor and generator section and the outlet box section in their group meetings, which were held in connection with the Policies Division meeting.

Electric Vacuum Cleaner Has Two New Sales Assistants

M. R. Sutherland and Harry C. Hahn have been appointed assistant sales managers of the Electric Vacuum Cleaner Company, Inc., Cleveland. They have been associated with the company for many years.

Mr. Sutherland has entire charge of organization matters, and is responsible for the field personnel. Mr. Hahn is responsible for trade relations of the sales department.

Norton Elected Director of Miller Company

Guy P. Norton, vice-president of The Miller Company, Meriden, Conn., has been elected a director. He first became engaged in the manufacture of lighting fixtures in 1898. He helped perfect the first Duplex-a-lite organization, which became the Duplex Lighting Works of the General Electric Company in 1918. In 1924 this department was sold to The Miller Company. A year later Mr. Norton became vice-president and was placed in charge of sales.

Guy P. Norton, vice-president of the Miller Company, on his favorite mount

Wolcott Manufacturing Unites with Beardsley Company

Frank E. Wolcott, Manufacturing Company, 80 Pliny Street, Hartford, Conn., and Beardsley Manufacturing Company, Waterbury, Conn., have been consolidated as the Beardsley & Wolcott Manufacturing Company. Both companies manufacture household appliances.

The new officers are: C. E. Beardsley, president-treasurer; Frank E. Wolcott, vice-president; Rowley W. Phillips, secretary; Elton S. Wayland, Henry W. Adams, Jr., George T. Wigmore, Irwin W. Day, and William S. Fulton, directors and officers.

Minimum Specifications Set for Fractional Motors

The Joint Committee on Fractional Horsepower Motors during the past year has brought about a greatly improved situation in the industry. This committee is composed of representatives of the National Electrical Light Association, National Electrical Manufacturers Association, American Washing Machine Manufacturers Association and Association of Edison Illuminating Companies. Unorganized appliance manufacturers are represented by individuals. The committee was initiated by C. F. Hirshfeld of the Detroit Edison Company.

The committee has dealt with improving fractional horsepower motors through agreements as to minimum specifications for efficiency, power factor, starting current and apparent efficiency. These agreements are expected to bring about very desirable results. The economic cost to the industry as a whole has been weighed, and each group has contributed a share of the burden.

The committee decided that all fractional horsepower motors should be divided into two classes—long hour use motors and short hour use motors. Long hour use motors operate a large number of hours per month, in the aggregate, and consume sufficient energy to make efficiency of economic importance. Short hour motors operate a relatively small number of hours per month, with small consumption of energy.

Minimum specifications for long hour use motors operating on 110 volts, 60 cycle circuits at 1800 r.p.m. have been agreed upon as follows:

Rating Hp	1/8	1/6	1/4	1/3	1/2	3/4
Power Factor	52	56	60	61	63	65
Efficiency	53	58	62	63	65	67
Apparent Efficiency	30	36	42	44	47	49
Locked Rotor Amps	20	20	20	20	26.6	40
Locked Rotor Amps at 75% Load	15	15	15	15	20	30

Minimum specifications for short hour use motors operating on 110 volts, 30 cycle circuits at 1800 r.p.m. have been agreed upon as follows:

Rating Hp	1/8	1/6	1/4	1/3	1/2	3/4
Power Factor	50	52	56	58	60	62
Efficiency	41	46	51	54	58	61
Apparent Efficiency	24	27	32	35	39	42
Locked Rotor Amps	20	20	20	20	26.6	40
Locked Rotor Amps at 75% Load	15	15	15	15	20	30

The clothes washer motor was made an exception to the short hour use motor specifications. It must conform to efficiency, power factor and apparent efficiency, but not to locked rotor ampere specifications. The committee felt that more time should be devoted to working out the clothes washer motor problem.

An ultimate date of January 1, 1929 was agreed upon as the time when all new motors should conform to the new specifications. The committee's report already has the approval of the majority of the appliance manufacturers.

H. K. Dewees Now Manages Edison Simplex Division

H. K. Dewees has been placed in charge of the Simplex Division of the Edison Electric Appliance Company. This division is the former Simplex Heating Company, which has recently been acquired by the Edison Appliance Company. Mr. Dewees was formerly assistant appliance sales division manager of the Edison Company. His new headquarters will be at 5600 W. Taylor Street, Chicago.

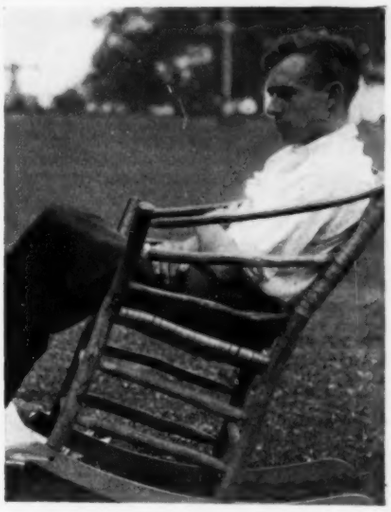
H. K. Dewees

The Simplex line of appliances is being continued. These are now being serviced by the nation-wide system of service stations established by the Edison company. The Simplex Division is keeping the same sales personnel with which it operated as an independent company.

J. Eugene Armes of the Edison appliance sales division succeeds Mr. Dewees as assistant sales division manager.

Lovejoy Leaves Nema

Members and officers of the National Electrical Manufacturers Association and scores of friends throughout the electrical industry learned with keen regret of



Once upon a time E. P. Lovejoy was known to sit down and take his ease. The occasion, at Association Island in September, 1927, was so historic that the editor immediately immortalized it in picture. If "E. P." works his Illinois farm as hard as he worked himself, his corn crop for 1928 should run 200 bushels per acre instead of a mere 70 or 80

the resignation of E. P. Lovejoy, Jr. (effective March 31) as director of publicity of Nema. Mr. Lovejoy, during his service, developed a publicity department second to none among the electrical trade associations. The good wishes of the industry go with him, as he takes up his management duties on his father's farm near Princeton, Ill.

Crosley Appoints Abbott General Sales Manager

H. Curtiss Abbott

H. Curtiss Abbott, for the past two years sales manager of the Kellogg Switchboard & Supply Company, 1066 W. Adams Street, Chicago, has been appointed general sales manager for the Crosley Radio Corporation, Cincinnati. Mr. Abbott is a Yale graduate, and for many years he was assistant to the owners of the Lyon & Healy Company, Inc., a music concern.

R. M. A. Annual Convention Slated for Chicago

The fourth annual convention and trade show of the Radio Manufacturers Association will be held June 11-15 at the Stevens Hotel, Chicago. Coincident with this, there will be meetings of the National Association of Broadcasters and the Federated Radio Trades Association. An attendance of from 25,000 to 30,000 is expected at the combined trade show and convention. H. H. Frost, vice president of Federal-Brandes, Inc., is in charge of the trade show, with G. Clayton Irwin, Jr., of Hermann & Irwin, responsible for the exhibitions. C. C. Colby, president of the R. M. A., will preside over the convention.

Hoover Will Not Make Radio Receivers

Hoover Company, North Canton, Ohio, has issued official denial of the rumor that it is about to embark upon the manufacture of radios, radio parts or allied products. The company says that it contemplates no venture into the radio field. Its only product is the Hoover electric vacuum cleaner in three models.

C. D. Boyd Named Sales Head of Metal Specialties

Carl D. Boyd, prominent in the radio manufacturing field, has been appointed general sales manager of the Metal Specialties Manufacturing Company, 338 N. Kedzie Street, Chicago. To fill his new position he resigned as first vice-president of the United States Electric Corporation.

Carl D. Boyd

From 1916 to 1920 he was president of the Southern Electrical Supply Company, electrical jobber. From 1920 to 1925 he was radio sales manager for the French Battery Company, Madison, Wis. He then became vice-president of the Apex Company.

The Metal Specialties Manufacturing Company manufactures electrical and automotive devices.

All-American and Mohawk In Consolidation

All-American Radio Corporation and Mohawk Corporation of Illinois have been consolidated under the name of the All-American Mohawk Corporation with factories and offices at 4201 Belmont Ave., Chicago. E. N. Rauland is president, Gustave Frankel vice-president, Otto N. Frankfort vice-president in charge of sales, Donald MacGregor treasurer and Douglas De Mare secretary.

J. W. Packard Dies

J. W. Packard, founder of Packard Electric Company in 1890, and its president until he sold out his interest in 1916, died on March 20. He manufactured the Packard lamp and designed the Packard automobile.

Conrad Hubert, Aged 70 Dies at Cannes

Conrad Hubert, chairman of the Board of Directors of the Yale Electric Corporation, died Wednesday, March 14, at Cannes, France. His body was brought back to the United States for burial. He is survived by two brothers and a sister. He was a member of the New York and Brooklyn Chambers of Commerce, the Electrical Manufacturers' Association, and the Progress Club. He was a director of the Pyrene Manufacturing Company and secretary, treasurer and a director of the Fordbrad Realty Company. He was 70 years of age.

W. W. Trench Now Secretary of General Electric

William W. Trench has succeeded Myron F. Westover as secretary of the General Electric Company. Mr. Westover retired after serving as secretary for 34 years. Mr. Trench was formerly assistant secretary.

Wm. W. Trench

Mr. Westover has been actively identified with the electrical industry for 40 years. His first position was that of secretary to the late Charles A. Coffin, then treasurer and manager of the Thomson-Houston Electric Company.

Mr. Trench is 36 years of age and a graduate of both St. Lawrence University and the Brooklyn Law School. He was admitted to the bar in 1916.

C. E. Corrigan, Director, National Molding, Dead

Charles E. Corrigan, vice-president and a director of the National Metal Molding Company, died at his home in Sarasota, Fla., on March 24. Mr. Corrigan entered the electrical business in 1904 as the head of the Osborne Flexible Conduit Company. In 1906 this company sold out to the National Metal Molding Company, Pittsburgh, which was then being organized. He became vice-president and sales-manager of the new company, and held that position until his retirement from active duty in 1925. He continued as vice-president and a director until his death.

C. E. Corrigan

D. H. Darrin, Manufacturer, Dies at His Home

David H. Darrin, president of the Automatic Switch Company since 1901, died March 29 at his home in Highland Park. Mr. Darrin was a life member of the American Society of Mechanical Engineers and held membership in the General Society of Mechanics and Tradesmen, the Engineers' Club of New York, the Engineers' Golf Club and the Port Chester Country Club.

Mechanical and Electrical Design Are Interdependent

By D. H. BRAYMER

Consulting Engineering Editor, ELECTRICAL MANUFACTURING

D. H. Braymer, formerly editor of ELECTRICAL RECORD *and also of Industrial Engineer, in accepting the position of consulting engineering editor of* ELECTRICAL MANUFACTURING, *spotlights one of the opportunities for service which face the new paper. His letter, which deserves the attention of the electrical manufacturer as well as the publisher, is as follows:*

MAY I take this opportunity to congratulate the Gage Publishing Company on the conception and creation of ELECTRICAL MANUFACTURING, a much needed paper, to be devoted to the problems of those who make, apply and service electrical products, motor-operated appliances and machines? In my judgment, no field of publishing offers a greater opportunity for helpful service. Because of the outstanding advance in the application and demand for electrically-operated machines and devices, and the accessories necessary for their installation, the scope and trend of electrical manufacturing as an industry in the future can only be roughly pictured by even those who are intimately engaged in it.

For more than fifteen years as an editor of electrical publications, the writer devoted much study and investigation to the economies and practical applications of electrical service in mills and factories and public buildings, and the necessary maintenance of electrical and associated mechanical systems required to bring about the results that might be accomplished. It is in this field of what might be termed large unit electrical manufacturing that the writer sees a distinct opportunity for service by such a publication as ELECTRICAL MANUFACTURING. It should bring together what the user requires in an electrical application and what the maker can provide. To anyone engaged in the manufacture of anything electrical, the need of this specialized publication should be obvious.

In the manufacture of electrical apparatus and electrically-operated devices and in their application, the mechanical and electrical problems cannot longer be dealt with as two independent things, but must be viewed as a unit. Frequently when the electrical feature is actually built into a machine or device, it requires mechanical changes or complete new designs. Hence today the mechanical engineer must be more familiar than ever with electrical design as well as mechanical design. This is also true in the application of electrical service, motors and the like to existing apparatus, for the electrical factors of speed, voltage and frequency (together with the devices to control the same) must weld into the mechanical service from the device operated so as to accomplish the desired results.

Men who specify, men who make, and men who install electrical apparatus follow much the same kind of thinking, and any effort to bring them together through a publication is a worthy effort. During the past three years the writer has been engaged in engineering work and has come into contact with architects and mechanical engineers who specify mechanical and electrical systems for building service. Although buildings require equipment for light, heat, transportation and ventilation much the same as they have for many years, the methods and equipment employed vary with the experience and willingness of the architect or consulting engineer to make use of what may be considered as new and untried electrical and mechanical manufacturing ideas.

Frequently it is found that an architect serves as his own electrical and mechanical engineer, and his specifications show a distinct need in such a case for both electrical and mechanical advice and suggestions. In ventilation work is this particularly true.

D. H. Braymer

Here the device now commonly employed for forced ventilation is a housed fan operated by an electric motor which may supply air as in a theater at a predetermined temperature and humidity. The usual public building specification, for a school, for instance, governing the selection of a fan calls for a definite cubic feet per minute air delivery against a definite static pressure, this installation to be free from noise and vibration at a definite rotating speed. This device is then specified to be operated by an electric motor mounted directly on the fan housing or belt connected in the larger sizes and controlled by a suitable starting and stopping device. I have before me at the present moment such a specification, in which it is stated that the fans must be specially quiet in a school building, but motor speeds of not to exceed 900 r.p.m. are demanded. Direct motor-driven units are called for at motor speeds that are not standard and are impossible of direct connection. It is also specified that the motor horsepower must in all cases be 50 per cent more than the brake horsepower of the fan. Moreover, the fans and motors are specified to be installed by a heating and plumbing contractor, and the electrical control or starting and stopping devices by an electrical contractor. This is not an unusual specification. Here the electrical unit is split into two parts, and under such conditions it usually requires a qualified third party to fit them together and make them work.

It is obvious that the writer of such specifications overlooks or does not know that 900 r.p.m. motors, belt connected, are more noisy in operation than higher speeds of motors owing to the inherent characteristics of the electrical design, and that they cost more money without accomplishing as good results. Induction motors 50 per cent larger in rating than the load requires are not only insufficient in operation with poor power factor but uncalled for when fan manufacturers are required to guarantee the characteristics of the units they supply. Strictly from a competitive standpoint, such specifications unfairly penalize the fan manufacturer for the building of efficient apparatus and cost the owner money that could well be spent elsewhere.

This example of faulty applications of electrical apparatus might be multiplied by many others similar in nature wherein the need of operating standards by the manufacturer might be set up in non-technical language and used to the benefit of all concerned. If this can be accomplished by ELECTRICAL MANUFACTURING as a publication it will eliminate costly misfits in all industries and help to bring a much needed coordination of mechanical and electrical engineering. The writer feels that this publication represents a marked step ahead in electrical publishing and knowing the ability and earnestness of the publisher to be of service to all industry, he feels certain that this new publication will quickly find a useful place for itself among a wide group of readers interested in the advance of the electrical industry and an extended use of all products electrical as a whole or in part.

20% Increase in Production

This is the F. A. D. Andrea radio manufacturing plant in Long Island City, N. Y.

Through Straight Line Assembly

Shorter path from raw material to completed product reduces production costs in Fada radio plant

By C. A. Sieweck

Factory Manager, F. A. D. Andrea, Inc.

TO meet the increasing demands for Fada Radio products and to decrease the cost of their manufacture was a problem which confronted F. A. D. Andrea, Inc., constantly from the time the parent company was organized in 1920 until the modern Long Island City factory was placed in service in 1927. The critical point was reached in 1926. Every inch of floor space was utilized, but still it was impossible to meet the exacting promises of delivery. As a result, the management initiated an intensive analytical study of the floor space requirements, and the methods and practices followed in the manufacturing processes, for the purpose of determining wherein the floor space and production could be increased and the unit manufacturing costs decreased. This resulted in the discovery that it was imperative to make several changes which, when put into effect, proved beneficial to the overhead and production costs, as well as to the quantity of production.

The five outstanding changes consisted of:

1. Centralization of all manufacturing, engineering, transportation, receiving, shipping and testing organizations under a common roof.
2. Introduction of a straight line system for the manufacture and assembling of parts.
3. Factory layout arranged to keep the production paths at a minimum.
4. Rigid inspection and testing systems.
5. Installation of additional machinery and tools to perform the manufacturing operations efficiently.

New Factory Acquired

THE parent company started business in a small room adjoining a store located on upper Jerome Avenue, New York City. The business increased to such an extent that the manufacturing was being performed in five buildings, and the total floor space occupied was approximately 70,000 square feet.

The company appreciated the importance of planning ahead for a possible expansion of its manufacturing facilities to take care of the ever increasing business. It was determined definitely that no further factory expansion was possible in the present location, due to the fact that additional space could not be procured.

A factory building was therefore rented in Long Island City, during the summer of 1927.

Providing for Maximum Production

THIS building occupies about three-quarters of the block bounded by Orchard Street on the north, Queens Street on the south, Jackson Avenue on the west, and the Long Island Railroad on the east. It is of steel construction, reinforced with brick and concrete, and it is five stories in height. Two Otis elevators of 8000 pounds capacity each are installed. One is located on the east side near the center of the building, and the other on the north side near the northwest corner.

Due to the fact that the first floor could not be obtained, the combined floor space of the four floors, amounting to 100,000 square feet, was not sufficient for the complete organization of the proposed layout. A new one-story structure was therefore erected, on the Queens Street side of the building, and used as a receiving and shipping department. This structure provided an additional floor space of 25,000 square feet. A new Otis elevator of 8000 pounds capacity was installed on the north side of this building, and this elevator connects with all floors of the factory.

A multiplicity of glass on three sides of the factory, together with the interior white finish, provide a maximum of natural light. The artificial lighting fixtures were rearranged to provide a maximum of light at a minimum expense.

An engineering survey was made of each floor, and great care was exercised in preparing the layout, to assure that

the machinery and working facilities would be arranged so as to provide maximum production and minimum handling. Considerable thought was also given to the aisle arrangement, so that transportation of material would be unobstructed. The plans considered the use of such of the old machinery as could be used efficiently.

The various manufacturing processes are centralized in sections on each floor, and these sections are designated by a number which appears conspicuously on a column adjoining the section. The outsanding feature of the shop layout is the arrangement of the machines and benches for carrying on all manufacturing processes on a straight line basis. This arrangement has proved satisfactory, resulting in an increase of production of at least 20 per cent.

This is a section of the fourth floor, where the full advantage of straight-line assembly is obtained. Each man performs a definite operation, and the receiver progresses to the wrapping department in the rear

About one-half of the second floor along the south side is occupied by the service and tool room organization. Spacious paint dipping and metal washing rooms are located on the west side.

Hand Made Models Important

ABOUT three-quarters of the third floor is used for the storage of cabinets, cartons, etc., and the engineering department occupies a space on the northeast corner for offices and laboratory. A small room equipped with several machines, adjoining this section, is used by the engineering department in experimental work. The production and purchasing departments occupy offices along the west side, and a fully equipped first aid room, with a trained nurse attendant, is located near the production office.

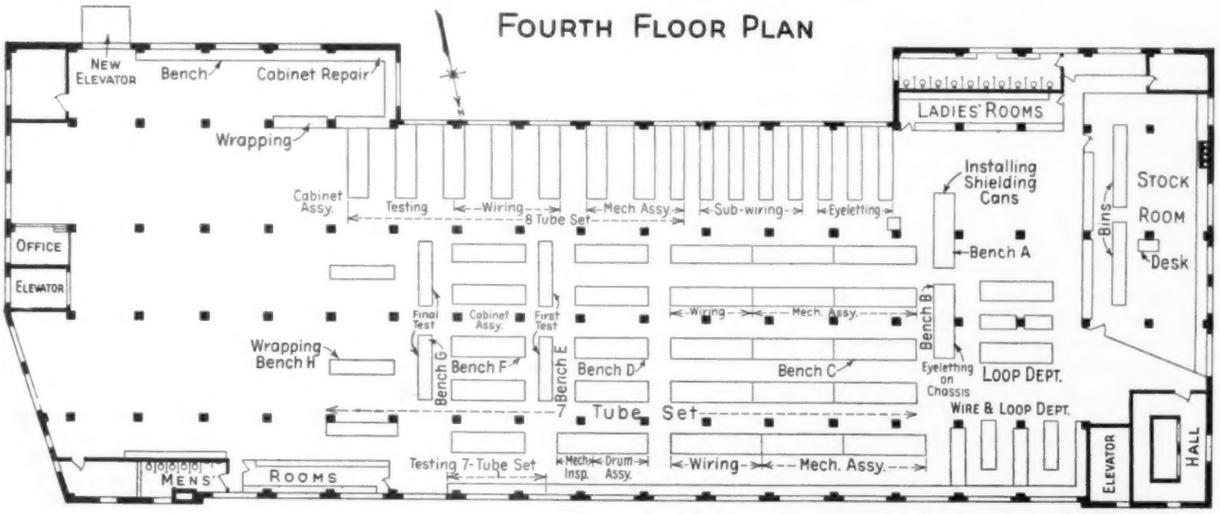
The fourth floor is used for assembly work. This work is started at the west end of the building and passes from operator to operator along the various benches until it reaches the wrapping department in the east end. This floor is equipped with a large storeroom, containing the necessary small material used in assembly work.

The fifth floor is used principally for the manufacture and assembly of the parts which go to make up a complete receiver. A storeroom of similar design to that installed on the fourth floor provides the necessary material for the various departments.

When this company decides to place a new receiver on the market, the problem of its design is assigned to the engineering department. A hand-made model is constructed in the model shop, and a test is conducted to determine the life of the various parts. The type of the tubes to be used is determined during this test. The model is then turned over to the mechanical division of the engineering department for the final design of all details. The necessary blue prints are prepared after the numerous details have been approved by the management.

The tool department then receives orders for the manufacture of the necessary tools and dies to produce the parts. The general manager decides on the quantity, daily rate of production, etc. As soon as he releases the order, production orders are entered in the production department, and the required material requisitioned on a standard form, which is turned over to the purchasing department. This form also includes the schedule of delivery. Orders specifying the quantity and daily rate of production are also issued to the various manufacturing divisions.

When the material is received, the quantity is checked against the purchasing order. It is then transferred to the inspection and stores departments, where it is inspected for electrical and mechanical qualities. If the qualities are found to meet the specifications, the material is turned over to the stock department. If, on the other hand, it is not satisfactory, it is transferred to the salvage department, from which point it is returned to the shipper. The heads



Fourth floor plan of the Fada plant, showing Benches A to H, which cover the whole production route of the seven and eight-tube receivers, from the raw material to the wrapping of the product all ready for the market

of the various departments draw their material from the stores on shop requisitions and charge it against the proper factory order.

Let us now follow the assembly of a seven-tube radio receiver from the raw chassis material to the shipping room. A sheet of 1/16-in. auto body steel is placed in a powerful press, punched and formed in one operation. It is then transferred by a hand truck to the washing room and placed in a washing machine containing a hot lye solution to remove all particles of oil. When dry, it is transported by truck to the paint dipping room for painting. From the dipping room it is transported by truck and elevator to the fourth floor and placed upon Bench A, as shown on the fourth floor plan which is reproduced as part of this article. All eyelets are applied for fastening certain equipment and through which wires enter and exit. After being transferred to Bench B the various shielding cans are placed in position.

Each section of the fifth floor, shown here, is devoted to a different manufacturing process. The sections are clearly numbered and straight line assembly is used wherever possible

Functioning of Straight Line Assembly

THE first operator on Bench C installs fixed condensers, rod brackets and springs, and passes the job along to the second operator, who places the resistances and choke coils in position. The third operator then applies the transformers and variable condenser brackets, and adjusts the springs. From him the job is passed to the fourth operator, who mounts the variable condensers, potentiometers and volume control switch. The fifth operator places the radio frequency and antenna coils in position, mounts the connection boards, and at the same time passes all loose wires through the eyelets. The sixth operator adjusts the volume control switch and installs the audio units, and the seventh lines up and adjusts the variable condensers.

The eighth, ninth and tenth operators place assigned groups of wires in position for soldering. The eleventh and twelfth operators perform all soldering of assigned groups of wires. The job is then passed to the thirteenth operator, who makes a careful inspection of the wiring and workmanship.

The first operator on Bench D installs the tube housing and turning dials. The next operator mounts and adjusts the friction drives, and the third operator completes the final lining up and adjustment of the variable condensers. Then the receiver is given a continuity electrical test by the fourth operator, and the fifth operator installs all of the covers. The sixth operator makes a mechanical inspection.

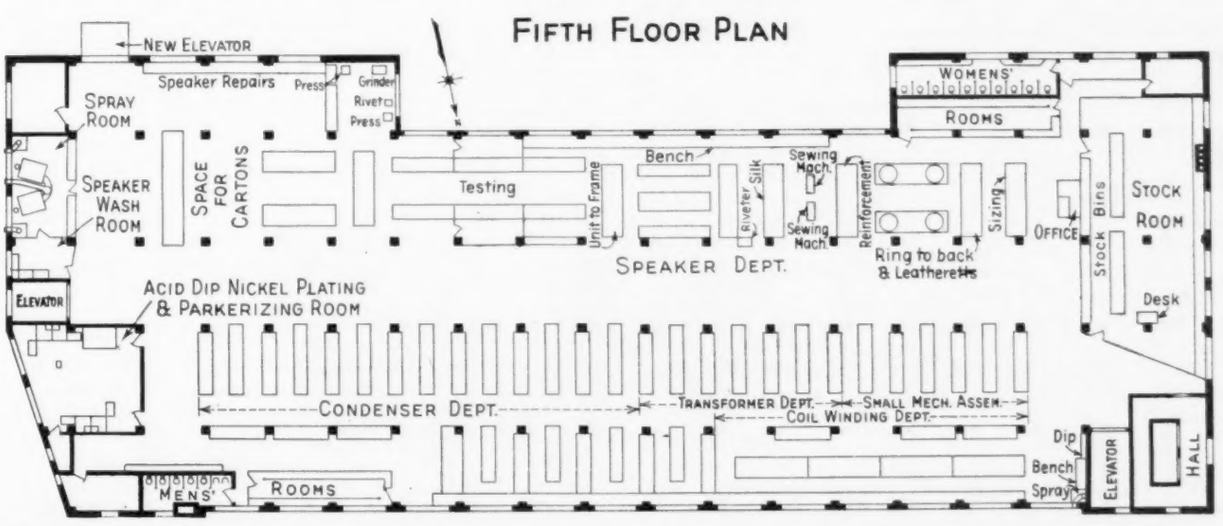
The job is then passed to Bench E, where the receiver is given a preliminary and neutralizing test. From here it is passed to Bench F, where it is placed in a cabinet, the necessary external connections made and the loop installed. At Table G a final and operating test is performed, and the receiver is then passed on to Bench H for wrapping.

It will be noticed that all operations are performed in the direction of a straight line. This same system is followed in all of the departments where it is possible to do so.

The layout adopted has been found entirely satisfactory to meet the exacting demands of rapid, accurate and systematic manufacturing of radio receivers. The exact time is known for each manufacturing process and therefore the rate of production can be intelligently controlled.

Trucks designed especially for picking up boxes and crates from the floor facilitate the handling of material and eliminate considerable loss of time and labor.

Numbering each manufacturing section has been found very advantageous. Material can be assigned to the proper sections and little time lost in locating the point of its delivery. It has also been found that efficiency and economy of production cannot be obtained unless all manufacturing facilities are centralized.



This diagram of the fifth floor in the Fada radio plant also shows the use of straight line assembly for the production of loud speakers, transformers and condensers. They progress in an easterly direction toward the wrapping room

Felt—How the Industry Uses It

No. 1 of a Series of Articles on Common Materials

Manufacturers of electrical appliances find that felt is almost indispensable to them as a non-scratching base. It is also used in lubricating systems

By William Crawford Hirsch

FELT possesses physical properties which make it a highly useful material, not only in numerous products of the electrical industry, but also in important finishing processes. As a retainer and dispenser of lubricants, it plays an important part in many motors. The metal surface of lighting fixtures and other appliances owes its luster to felt wheels whose swift rotation makes possible the desired action of the polishing substance. Large quantities of felt are used in cushions and pads on the base of electrical appliances to prevent abrasion of polished surfaces. Felt is a non-conductor of sound, and this adds to its usefulness, as for instance on the base of telephone desk sets.

FELT is only one of many common materials which are used in the manufacture of electrical products. Some of the materials are: foils, mica, slate, soapstone, lava, zinc, platinum, aluminum, copper, asbestos, graphite, paper, cloth, tape, fiber, moulded insulation, porcelain, solder, waxes, varnish, lacquer, yarns, thread, rubber, oil, chemicals, coloring and preservatives. Articles on all of these materials will appear from month to month in Electrical Manufacturing.
—The Editor

Felt is made either of wool or cotton or of a mixture of both. Formerly the designation of felt was confined to a material made by pressing, the process resembling very closely that of papermaking. In recent years, however, pressed felts have been joined by so-called woven felts which represent a combination of weaving and pressing. In many uses pressed felts are indispensable—especially so in mechanical applications. The woven felts have many uses in which they are only remotely competitive with pressed felts.

The number of grades of felt is legion, running into many thousands. There is no defined dividing line between the so-called hard and soft felts, many grades being in the twilight zone of hard and soft. The felt manufacturer's first question is always: "For what do you wish to use it?" because the special demands made upon felt alone can determine the correct grade to be used. A desk or table lamp is not moved about as frequently as is a desk telephone. A heavy brass desk lamp, on the other hand, calls for greater protection to the polished surface on which it stands than does the relatively light desk telephone. Different grades of felt for the bases of the two are, therefore, indicated. Some years ago, leading telephone companies made a close study of this subject on the basis of their experience as well as a series of tests. As a result of their experiments, they adopted a felt which gives per dollar of cost the longest amount of wear under average conditions.

Mechanical felt is not a special grade, but any felt which is used for mechanical purposes. A very high grade of felt is used for wheels that serve in finishing processes, such as polishing and buffing; and this has led to the mistaken impression that mechanical felt is a special, high-grade product.

Felt is sold either by the yard or the pound, depending upon grade and purpose. In addition to the felt manufacturers, there are cutters who produce lubricating wicks, washers, gaskets, strips, and other felt parts, using specially designed electrical machinery in the cutting and punching operations. Some of the manufacturers operate cutting departments in connection with their mills Some electrical consumers buy their felt by the yard or pound from the manufacturers and do their own cutting. In some instances, electrical consumers cut their own strips and other simple parts, but have more difficult shapes cut in specialty plants.

Felt wheels are made in a large variety of sizes and grades, ranging from about 6 in. to 20 in. in diameter and from ½ to 3 in. in thickness. They are either white or gray and come in different hardnesses which are usually designated by letters—"C" being medium, "D" hard, and "E" rock-hard. Two leading classes of felt wheels are known as "White Spanish" and "Gray Mexican" which are trade designations and are not to be interpreted as denoting the geographical source of supply.

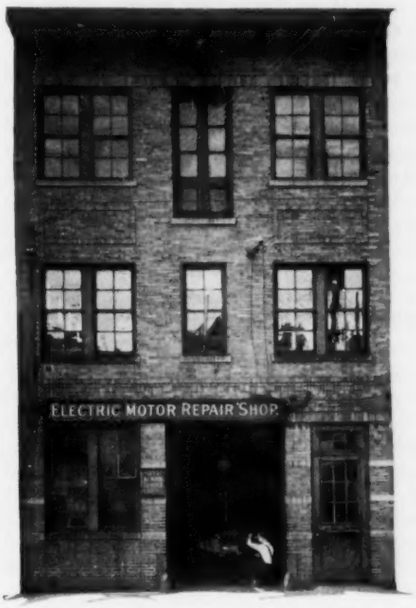
For wicks in motor lubrication soft felts, that must be able to withstand constant friction, are used. They are sometimes referred to as oil box felts. Their ability to absorb and retain lubricants, as well as to dispense these in minute particles, is, to a large extent, determined by the amount and grade of wool in the felt. A good many small felt parts, such as washers, gaskets and rings, are used in connection with electric pumps and similar machinery.

Medium thick felts are used on the bases of table and desk stand lamps, electric fans, and desk clamp push buttons. Vacuum cleaner manufacturers use felt, not merely in lubricating their appliances, but also in making some parts dustproof. A steadily growing use of felt is in floor-waxing attachments of vacuum cleaners. It is also used in the form of gaskets under the rims of instrument covers to exclude the dust, and also to pack bearing ends. Aside from felt's part in phonograph motors, turntable discs of these instruments are felt-covered so as to guard the records from scratching and to provide a surface which can easily be kept free from dust. Motors of electrical refrigerators call for constantly increasing quantities of wick felt. Uninterrupted functioning of electrical refrigerators is largely a matter of dependable lubrication of the motor's vital parts. Being a household appliance, it must be "foolproof," and the right sort of felt can do much toward retaining the lubricant in proper condition and supplying the required number of drops daily to the machinery.

Only a relatively slight amount of felt is imported. This consists of specialties for which there is a limited demand. In former years much was heard regarding the superiority of European felt, alleged to be due to the washing of the wool before shearing. A good deal of domestic wool is washed on the hide. While there have been no marked changes in felt-manufacturing methods in the last few years, American manufacturers have kept pace with industrial progress generally, and their product is equal to the best the world's markets afford.

Flexibility of Personnel Plays Its Part in

Organizing a Motor Repair Shop



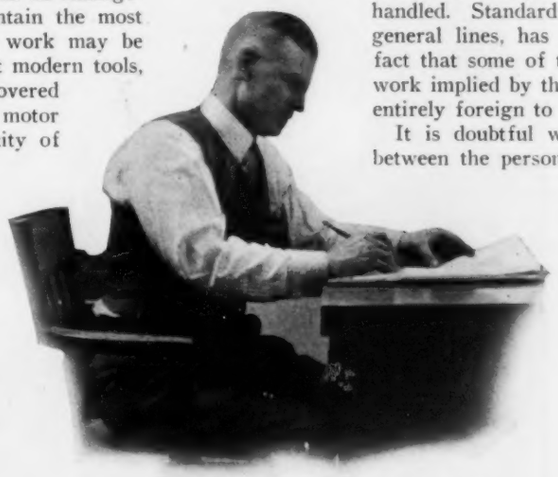
All employees of the modern repair shop should receive a broad general training before they are allowed to become specialists in any one line

By J. H. Ram
President, A. C. Motor Service Co., Inc.
Jersey City, N. J.

At the left is the three-story brick, concrete and steel factory of the A. C. Motor Repair Company. J. H. Ram, at the right, is responsible for the executive end of the business

THE constant effort which is being made to effect economies in motor repair work has caused a searching inquiry to be made into many divisions of the work which in normal times have been subjected to rather superficial and desultory consideration. The subject of organization may be placed in this class.

The business of successfully repairing motors requires the co-ordination of many mechanical and electrical operations, the development of any one of which forms a subject whose history would be of interest to trace. No one of these can be said to be more vital to the customer's production activities than another, but from his standpoint it is the finished motor, together with its workmanship and operating performance, that determines his estimate of the motor repair company and its management. A shop may contain the most efficient machinery, the work may be performed with the most modern tools, other details may be covered flawlessly, but, if the motor does not assure continuity of service, the customer rightly criticises the management, and if possible withdraws his patronage. It may be said for the average customer that the finished motor and the quality of workmanship typify the motor repair company. To provide a high standard of workmanship requires the highest type of organization personnel.



E. E. Elder, vice-president of the company, supervises the production activities of the factory and passes upon the quality of the workmanship

In view of the above conditions we are joining hands with the motor manufacturers to produce repaired motors which our combined judgment and experience have shown to be necessary to meet the customers' needs.

There is a wide variation in the methods of organizing the personnel in different repair shops when considered from the standpoint of the various kinds of work being handled. Standardization of such organizations, even along general lines, has not as yet materialized because of the fact that some of these shops are performing not only the work implied by the company's classification, but also work entirely foreign to this branch of the industry.

It is doubtful whether any distinction could be drawn between the personnel organizations in different motor repair shops producing the same class of work. One very broad and significant generalization can be made, however, and that is the division between electrical and mechanical experts. Men considered capable of meeting the requirements of both of these branches are scarce. The thin ranks of such men are nevertheless growing appreciably larger. This is caused primarily be the fact that some motor repair companies are first training young men in all branches and then preparing them for specialization in one or more of the manufacturing processes. Of course, respon-

This shows a section of the coil winding department, which is equipped with modern winding and taping machines. Extreme care is exercised to have coils conform exactly to the winding data

sibility for these two cardinal services always merges somewhere in the company organization.

Very large motor repair companies organize with much specialization. The larger the company is, the greater the specialization. Many years of experience in the shop of a large motor repairer lead one to believe that this specialization is imperative for satisfactory workmanship. However, in companies of average size, and even much less than average size, this condition does not hold true. This is so because the volume of business is such that it would be uneconomical to employ men who could not be used on more than one class of work.

When the A. C. Motor Repair Company was incorporated, specialists were employed for each manufacturing process. This was not continued for a very long period of time as it was found that production was retarded because of the inability of employees to exchange the duties performed by them. This lack of interchanageability was such as to cause considerable strain in actual service. Exigencies of organization building and the natural capabilities and adaptabilities of individual men, which after all override any rigid educational demarcation lines, bring about, now and then, application of this sort of strain.

To overcome this nonflexibility and absence of interchanageability, the A. C. Motor Repair Company adopted a plan of employing younger men and training them carefully in all phases of the repair work, and at the same time laying particular stress upon the mastering of one or more special branches of the repair business. The results obtained from the institution of this idea have been amazing. The organization is now flexible, the men can be interchanged at will, and their services centralized on any production process. The increase in production possible with this arrangement can be readily appreciated.

The new policy has had two other important effects, which are, the elimination of the general unrest and dissatisfaction among the men caused by the changing from one class of work to another, and an intensified loyalty to our company. Under these conditions, it is not unusual to observe an expert armature winder taping coils if an emergency arises, or an expert coil taper performing the duties of an armature winder under similar conditions.

The young men we take into the organization are selected very carefully. Not only must they come up to our idea of physcal and mental qualifications, but also they must be flawless in their social life, habits and character.. During the training period we insist that their practical abilities and technical skill be developed until they are on a level with the requirements of the vocation to which they aspire. These men are trained so as to obtain a thorough knowledge of the inter-related processes, and any natural tendencies toward a certain line of work are cultivated. We note particularly whether or not they are actively interested in performing to the best of their ability each task undertaken.

Mr. Elder and myself are on an equal basis as far as the ownership of the business is concerned, and each have the privilege of issuing orders to any employee or section of the shop organization. We have, however, divided our responsibilities. Each of us assumes certain definite duties, so as to prevent any confusion arising from issuing contrary or unnecessary orders. I have been chosen to handle the executive end of the business, whereas Mr. Elder supervises the production. The organization at present consists of Mr. Elder, myself, one stenographer, one stock clerk, one machinist, nine armature winders, two coil winders and one truckman.

Since the men have all been trained carefully to perform work on any of the manufacturing processes, their labor is centralized at any point where it is necessary to speed up production. This idea of centralization has proved to be a very decided asset. It has permitted us to meet our promises of delivery and improved customer relationship.

The factory is divided into eight separate and distinct departments, as follows:

Overhead traveling chain hoists are effectively used in the larger armature winding department. A specially designed lathe and gas heated baking oven are shown in the rear to the right

1st Floor

1—Dismantling and assembling
2—Machine shop
3—Large armature and field winding
4—Dipping and baking

2nd Floor

5—Coil winding and taping
6—Small armature and field winding
7—Office

3rd Floor

8—Storeroom

These departments all function as independent units, but yet they are interconnected so as to operate as a complete unit. They are all fully manned except the dismantling and assembling, and the dipping and baking divisions. The work in these departments is performed by the men from other sections.

It is impossible, due to the expense involved, for all operating companies to carry spare motors for emergency use, and as a result these companies cannot be assured of a continuity of service. When a failure develops under these conditions it usually results in stopping the production of a machine or group of machines until such time as the motor is repaired and reinstalled. In many instances an electrical failure develops in the prime mover, which necessitates the suspension of production activities in the entire shop, thereby incurring a heavy financial loss.

Shown above is a section of the small armature department in which traveling chain hoists are also used. The same high standard of workmanship is found here

System for Motor Repairing

LARGE motor repairing companies cannot always give the customer immediate service to meet this emergency, and it is not unusual for a motor to remain untouched for several days after its arrival at the repair shop. These delays are caused primarily by the complicated office system involved in issuing the necessary orders.

This condition was given careful thought during the formation of our organization. A system was devised whereby the necessary orders can be issued almost immediately upon receipt of the motor in the shop.

In order to appreciate the simplicity of the functioning of our entire organization, I think it would be well to follow the production path of a motor from the time the order is received in the office until the motor is returned to the customer.

A job number is assigned to every order as soon as it is received, and this number is used throughout the factory for the charging of all labor and material during the completion of that job. A shipping ticket indicating the job number and the location of the customer is given to the truck driver, which gives him authority to procure the motor. This driver has received training in the shop and is capable of performing almost any operation. He records the name plate data of the machine on this ticket and notes the character of the work to be performed, method of installation, defects, etc. He gives the signed original to the customer and returns the duplicate to the office. As soon as possible after the motor arrives at the shop it is dismantled in the dismantling and assembling section and a specialist notes the size of the conductor, turns per coil, pitch, etc., of the elements, so as to provide data for the making up of the necessary coils and the rewinding. This information is recorded on a special card together with the name plate data, condition of bearings, work to be performed and such other information as will be of value throughout the production process. This simplified method of obtaining the winding data eliminates the usual delay caused by waiting for the manufacturer's winding specifications, blue prints, etc., since the complete data is obtained in a few minutes from the actual winding. Orders are then issued to the coil winding department to manufacture the necessary coils in accordance with this data. The old coils are stripped by any man available at the time. This often happens to be the truck driver. The stripped stator and rotor are boiled in a lye solution to remove all traces of grease, oil, acid, etc. If it is necessary to perform any mechanical work such as the installation of a new shaft, rebabbitting of the bearings, or repairing a broken end casting, it is turned over to the machine department. The machine is then transferred, according to its size, to the large or small armature winding section where the winding is applied. After this is completed it is preheated in the baking oven, dipped and baked by men taken from other departments, and reassembled in the assembly section.

Tests Are of Prime Importance

DURING the process of manufacture, careful electrical tests are made by armature winders who are especially trained in this field. After the motor is assembled completely it is subjected to a high potential test, and the entire machine is painted. It is reshipped to the customer as soon as possible after assembly, and a signed receipt is obtained for its delivery. Complete records of each machine are filed away for future reference. Each man is his own time keeper and is required to turn in a daily time card giving the exact time devoted to each job number. All material is drawn from the storeroom on job numbers and a daily card record is made.

We endeavor to keep in touch with modern motor design and repair practices, and, where our methods can be improved or better material procured, we do not hesitate to make immediate changes.

Mr. Elder supervises the production and inspects all manship is up to a high standard. This personal supervision has had the beneficial effect of stimulating the interest of the employees so that they use exceptional care to produce only the highest class of workmanship.

Due to the prompt service rendered and the functioning of the organization, we have been able to increase our business on an average of 100 per cent each year. Although at first we specialized on alternating current motor repair work, we were soon compelled to perform direct current motor repair work as well, as our customers were operating both kinds of machines.

Do Your Terms and Discounts CUT PRICES and PROFITS?

*Electrical manufacturer explains why his terms of thirty days and no cash discount ought to be profitable for other manufacturing concerns**

BY R. J. RUSSELL

Vice-President, Century Electric Company, St. Louis

NONE of us contend that we should be operating an eleemosynary institution, but some of the members of the electrical manufacturing industry may be doing so, for statistics point to the fact that 40 per cent of the manufacturing corporations in the United States during 1926 either lost money or made no profit. Possibly they gave some of the profit away in cash discounts and in carrying the value of consigned stocks with their customers.

We are in business to make our capital earn money. We take steps to prevent all the waste possible, even down to friction load on machinery. We endeavor to work our machinery to maximum strength and number of hours, going so far as to put recording meters on machines to show the number of idle hours, with the object of finding ways and means to keep them busy. We keep down our investments in and stock of raw and finished material in every way possible.

Price Bidding

AFTER careful consideration of all expenses, labor, material and interest (if it is thought of) for the short time necessary for the customer to audit, voucher and pay his bill, we establish a price and terms of payment.

We say to the salesman: "The price is $100. Our terms are 30 days net. If you *cannot* get that, telephone us what the competition is, for we need the business badly because we have 60 per cent more manufacturing capacity than we are using."

Since this is today a buyer's market and we have been experiencing it for some time, this has really made an auctioneer out of the purchaser. "What am I bid as to price?" "What am I bid as to terms?" "What am I bid as to cash discount?" All of these are quoted, and then the battle of wits begins. The buyer deceives the salesman usually by double meaning statements.

First the argument is about price—yours is highest. Then it is delivery—Blank will deliver F.O.B. in Podunk. Then it is the quantity necessary to secure that price—Blank will give any quantity we want and even send the goods here on consignment; we can report once per month what we have used; then Blank will bill us on his usual terms. Then it is about the extra charge for some special features or finish. Then it is terms —Blank offers us 60 days. Then it is cash discount—Blank offers 2 per cent, 10 days. No matter what the quotation specifies, the salesman knows there will be some important points, or at least so considered by the purchaser, on which a competitor has him beaten.

Orders at Any Price

OUR salesman understands that if he wants his salary maintained, he must bring in the business. We have told him so. We have told him nothing about the profit we must secure. We have not sought to interest him in anything except bringing in orders. We have not told him that the price and terms and conditions of sale we gave him to quote are final.

The salesman is *bound* to give his employer a distorted opinion of prevailing terms and conditions of sale when he thinks, unconsciously or otherwise, that his customer is the source of his remuneration when he is not close to his employer, and the employer indicates he is not definitely settled on his plan.

The N. E. M. A. Policies Division report of July 14, 1927, states only 59 per cent of the members cooperated in a fact finding investigation indorsed by that division, on the attitude of industry toward a constructive group program. The report showed that, in purchasing 36 items of material, three members bought carbon and cast iron, and two bought steel on 60-day terms. On no other item did more than one buy on 60-day terms. Three items were sold to not more than one member each on 20-day terms; credit no doubt influenced these terms. Twenty-seven items were sold to from one to six members on ten-day net terms; undoubtedly, the credit record influenced the restriction of open account terms to 10 days. On all the other items purchased, with three exceptions, the terms were 30 days for from 14 to 63 companies.

Can there be any argument as to what are the prevailing terms of sale among those industries from whom manufacturers of electrical apparatus, equipment, appliances and supplies obtain their material? I think not. The report established the fact that, practically speaking, we were all being treated alike.

In view of the foregoing, something seems a bit wrong with the electrical manufacturer's practice, because the following terms were being offered at that time by the electrical manufacturing industries:

30 days net, 5 per cent; 10 days; 30 days net, 5 per cent for cash inside of 30 days; 30 days net, 60 day trade acceptance if given within 10 days; 60 days net, 2 per cent cash in 10 days; 60 days net, 5 per cent cash in 30 days; 90 days net, 5 per cent cash in 60 days; 60 days net, 5 per cent for trade acceptance in 10 days.

I feel that many are wearing clouded glasses who give terms longer than 30 days, either on the bill or by deferring collection under the belief that they are holding their trade by so doing. That's one way of cutting the price and reducing profits.

Why Compete with Banker?

WHY invade the banker's field by such methods? He is organized to take the risk. Let him do it. I feel that 30 days is long enough for any well organized and prompt operating business organization to properly audit, voucher, draw check for and mail it to apply on its purchases.

If the manufacturer chooses to compete with the banker after the 30 days have expired, he should do so on the same terms and conditions and price for borrowing that the banker charges.

When considering all except large apparatus taking months to build, or very large contracts for goods to be installed by the manufacturer, and goods generally sold on time payments, I see no good reason, under present conditions, for extending any other than 30-day terms as part of the transaction involving the purchase of goods within the limits of credit which good judgment would dictate should be extended, based upon the financial responsibility and reputation of the buyer.

Those have been the terms under which, with very few exceptions, I have sold goods for 25 years, and with complete satisfaction. Some have taken more time and some have taken their business elsewhere because they could obtain more time, but

**From a paper presented before the Policies Division, National Electrical Manufacturers' Association, Chicago, March 14, 1928.*

our losses have been small and the business has grown as fast as I feel it should.

The practice of allowing cash discounts began to assume substantial proportions right after the Civil War. Manufacturers needed money, and banking facilities were not as they are now, so the cash discount was offered to provide ready cash. Merchandise was regularly sold to those who had proper credit standing on 60 days dating and four months extra, and profit was figured accordingly. The buyer was allowed as much as 7 per cent in ten days after shipment or dating. Rates for money were very much higher than now, and higher cash discounts were allowed. I do not construe the 7 per cent offered in those days as a trade discount as my experience has taught me to consider the 5 per cent for cash in 30 days extended today by some manufacturers on some classes of goods.

Discounts on Our Purchases

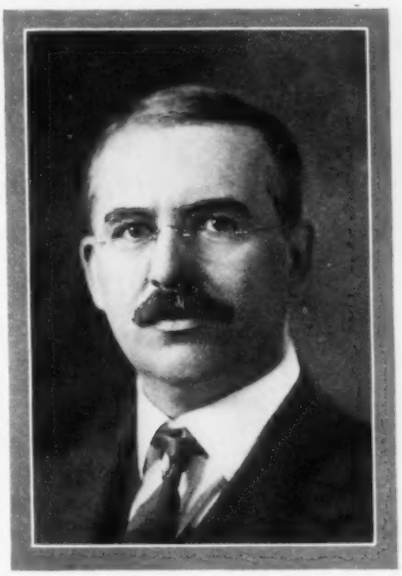
THE general practice today, taking trade as a whole, where cash discounts are allowed, is 2 per cent for cash in 10 days. But what is the practice in those lines allied with our industry? What are the prevailing cash discount terms on goods we purchase? That is best shown by repeating the figures from the N. E. M. A. report, which are the totals for the number of N. E. M. A. member companies *receiving* a given cash discount for a given item of purchase. Those figures are: 47 received ½ of 1 per cent, 10 days, on copper wire purchases, and 11 received the same discount on copper rod, etc., or a total of 58.

The totals figured in this way are as follows: ¼ of 1 per cent, 10 days, 1; ½ of 1 per cent, 10 days, 138; 1 per cent, 10 days, 641; 1 per cent, 15 days, 9; 2 per cent, 10 days, 463; 2 per cent, 15 days, 11; 3 per cent, 10 days, 8.

This suggests that if any cash discount should prevail in the electrical manufacturing industry, it should not exceed 1 per cent; and, even better, should be ½ of 1 per cent.

A 10-day cash discount is one of the most annoying and irritating features in business. It is constantly the cause of much friction between buyer and seller and takes much valuable time. Many very large institutions have abolished it. There are three classes of customers who cause trouble. One is short of money and looks to save every 2 per cent he can and, therefore, offers a good excuse for failing to remit on time. Another has a commercial organization which is either slow in handling bills or is hampered by red tape. Large buyers are the worst offenders. Another is continually trying to get a little bit more out of the seller than was agreed when the order was placed, and tries to take more time. His bills arrive too late or are lost in the mail. If we allow such abuse, we may discredit your salesman who has, no doubt, told the customer just what the terms are.

The return of checks to customers where a cash discount is taken, but not earned, is very unsatisfactory, especially where the amount involved is small. A really diplomatic individual letter is necessary to prevent offense. Many buyers' systems of vouchering are such that it is necessary to return the check in order to obtain the full amount and this, of course, increases the expense and delay. The sales department is continually representing that we must overlcok the abuse in taking cash discount for the fear of shutting off future orders which would be a distinct handicap to that department's efforts to keep a steady flow of merchandise out of the warehouse. For these reasons, I think it is worth while that we consider the policy of allowing a cash discount along with the cost of the cash discount to the seller and the additional expense, even though we cannot figure it in dollars, of the value of our correspondents' time in handling disputes.



I FEEL that many are wearing clouded glasses who give terms longer than 30 days, either on the bill or by deferring collection under the belief that they are holding their trade by so doing. ***That's one way of cutting the price and reducing the profit.***

—R. J. RUSSELL

As manufacturers of electrical equipment, appliances and supplies, we buy 50 per cent more goods on which the discount is 1 per cent 10 days than we buy on which it is 2 per cent 10 days. Since electrical manufacturers know what the cash discount terms are on what they buy, I cannot understand the reason for the larger cash discount terms generally quoted by them.

If all manufacturers in a given industry allow a cash discount at the same amount and on the same terms, eventually all will figure it into their cost, but if they allow a cash discount in *varied* amounts, those who do allow a cash discount in competition ultimately will find that they are taking it out of their profits, because those who do not allow a cash discount will meet the net price of such goods as are staple and thus put the price lower.

Excuses offered by those who are ready to take this amount out of their profits are: It conforms to the trade custom in many lines of business to make selling easier; to many purchasers, a cash discount is a pleasing factor for terms; it enables some purchasing departments to show what a saving they have made in cash on purchases, using that as a basis for more salary; to meet the desirability, not to say the necessity at times, of meeting competition; to promote closer collection; some gage the rating of their customers by the fact that they do or do not take the cash discount; to speed up collections that accounts may not be long drawn out, and thereby force the seller to hold shipment of orders because of long overdue items.

Against those excuses we have these disadvantages: The cost to the seller represented by what he pays for money when he allows a cash discount; sales resistance set up when discounts are not earned, but are taken after time has expired; expense of checking records to determine if discounts have been earned; expense of conducting correspondince concerning discounts improperly taken.

Large concerns really abuse the privilege more than the small ones. Also, due to their inability to pass invoices through their organizations in 10 days, they generally, when they are offered a discount, insist because of their size and large purchasing power that they be allowed to take it under terms such as tenth and twentieth of the month or the fifteenth and twenty-fifth of the month following shipment, giving as their reason the inability to pass bills and voucher them within 10 days and the convenience of issuing check for the full month's purchases at one time, and insisting that this really averages 10 days. This is not a fact, however, as you will agree. Such an average really extends from 10 to 20 days, and on top of that they fail to pay as often as they fail on 10 days' terms.

Is the cash discount worth while? Is it not an expense, the basis for argument, and a handicap which should be avoided?

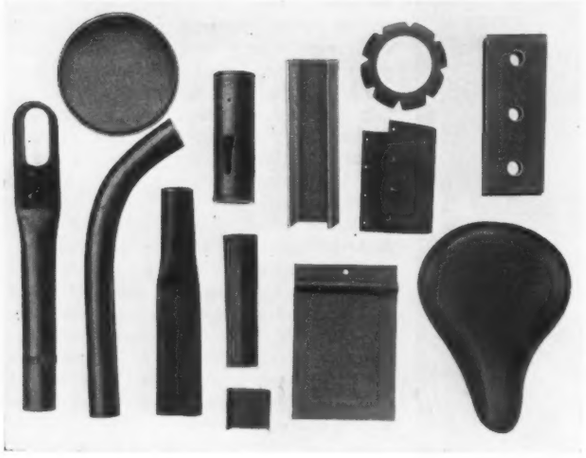
No Reason for Cash Discount

MY own experience over many years is that it should be discontinued. I have never had anything to do with a greater discount than 2 per cent, and that, and the later 1 per cent, were discontinued many years ago. I have had plenty of experience with no cash discount and did not find any particular difficulty in collecting accounts in a reasonable length of time. When forced by competition to extend a 1 per cent cash discount, it was supplied to fifty or sixty customers. It has gradually been withdrawn until, practically speaking, it is only in effect in five or six cases.

I can see no reaon whatever for a cash discount, and as I interpret that term, I am eliminating it entirely. My interpretation of the term "cash discount" does not include 5 per cent or any other discount in 30 days as a cash discount, but rather I consider it as a trade discount. I find it a distinct advantage to prevent all arguments between the collection department and the customer, except the one-sided one on which the customer has no comeback—"you owe us; we want our money."

The Electrical Industry Finds Many Varied Applications of

Hard Vulcanized Fibre



The making of vulcanized fibre, typical examples of its use throughout the electrical manufacturing field and methods of working fibre may suggest new uses for it in your business

By JOHN M. TAYLOR
President, Diamond State Fibre Company

THE term "fibre" does not accurately describe the product commercially known as vulcanized fibre. The word fibre brings to mind a picture of a long stringy substance, whereas the product, vulcanized fibre, has no such characteristic. On the contrary, it is a dense material, closely resembling horn in structure and is manufactured in three primal forms—sheets, rods and tubes.

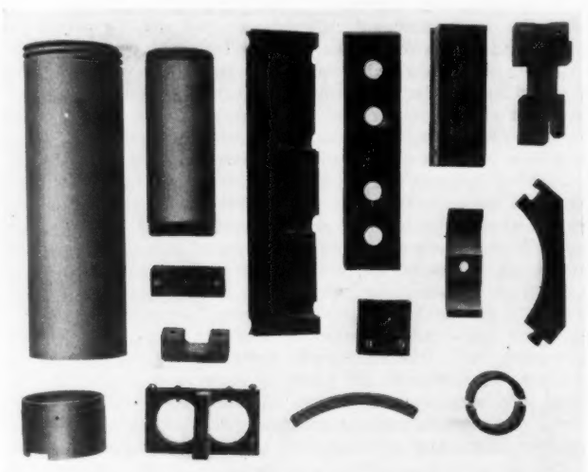
The word fibre as applied to this product was derived from the fact that the material is made from cotton fibres. However, in its finished form the fibres are not noticeable to the naked eye. Under a magnifying glass or microscope, the fibres are noticeable and these individual fibres are the secret of the extreme toughness of hard vulcanized fibre. There are two prime operations in the making of vulcanized fibre. One is the manufacture of a thin unsized cotton paper and the other is the conversion of this paper into the finished product.

Manufacturing Processes

THE paper is made from cotton rags that come to the fibre manufacturer from all parts of the world, principally Europe. These rags reach the fibre maker containing buttons, metal, rubber, grit and other foreign substances, all of which must be removed before the pulp, to which the rags are reduced, is converted into paper. The extraction of this foreign matter is a very important step in the manufacturing process. If metal, for instance, is permitted to remain in the stock, it will appear in the finished product and will seriously impair its insulating properties. Grit would also have a harmful effect on the machinability of the resulting fibre. Hence, the careful manufacturer takes extreme care to remove this foreign matter. In converting the rags to paper, the same general mill practice is followed as obtains in regular paper manufacture, except that the processes must be so arranged that all dirt is removed from the pulp.

When the rags are received at the fibre plants, they are dusted, sorted and graded. Then, they pass through rotary cutters, where they are cut to the proper size. After cutting, they pass over magnetic metal extractors and from there are fed into rotary kiers. The kiers are large rotary boilers, in which the rags are cooked under steam pressure. From this point the rags are drawn out into individual cotton fibres in several washing and beating operations. Then the stock passes through several foreign material extraction processes before being made into thin absorbent paper on a Fourdrinier paper-making machine.

In the second general phase of manufacture, i.e., the conversion of the paper into vulcanized fibre, the paper is passed through a solvent that hydrolizes or parchmentizes a certain percentage of the individual fibres. The action of the solvent reduces these fibres to a gelatinous mass. The paper is then wound on a drum about five feet in diameter, layers of the solvent saturated paper being superimposed upon each other until the proper thickness is reached. The entire mass is then removed from the drum and cut into sheets that will, in the finished state, be about 50 in. wide by 72 in. long. At this point in the manufacturing process, the sheet is saturated with the solvent and is about twice the thickness that it will be in its finished form and about 60 in. in width. The solvent, having performed its function, must now be removed. This is accomplished by a slow and tedious leaching process that in some of the heavier thicknesses requires months to complete. As the solvent is removed, it is re-



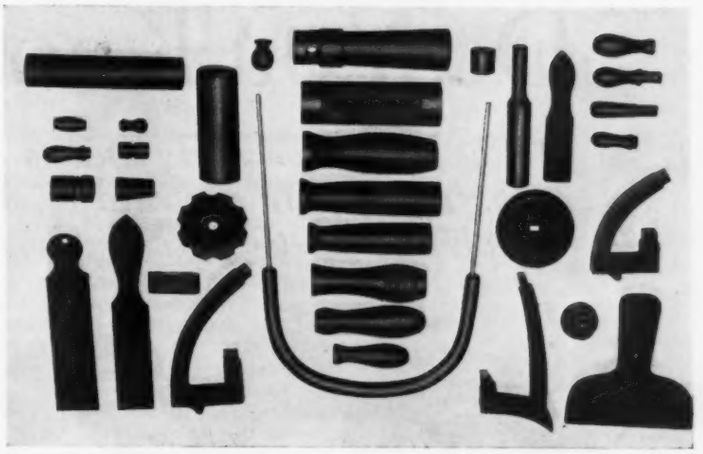
Vulcanized fibre, being easily machined, is used for a variety of parts such as those shown above. The second piece from the left in the top row is a fuse casing

placed by water. When the sheet is finally "pure" or free from solvent, it is placed in a kiln and dried. As the water is thrown off, the sheet shrinks to a hard, dense mass. At this point, the fibre is just as hard and dense as it will ever be, but the sheet is wrinkled and distorted in much the same manner as leather becomes wrinkled when it is wet and dried. To straighten the sheets, they are placed under heated hydraulic presses and come out flat and smooth. Many users of vulcanized fibre labor under the erroneous impression that the density of the material is obtained by enormous pressure. It should be noted that this density is an inherent property of the material and is not brought about by mechanical means.

Vulcanized fibre tubes are made by winding the saturated paper on mandrels, then removing the solvent in the same manner as that just described for sheets. The wet tubes are dried on rolling mandrels, after which they are passed through rolling mills and brought to size. Rods are made by sawing sheets into square bars and turning these into round rods on special rod turning machines.

For mechanical and electrical purposes, vulcanized fibre is made in three colors—gray, red and black, and in thicknesses of 0.005 to 2 in. The gray fibre is made from the natural, uncolored, raw stock. It is frequently referred to as the natural color. Red and black fibre is made by adding pigments to the stock in the beating engines, before it is made into paper. These colors are fast and will not run.

From sheets, rods and tubes, vulcanized fibre is converted into thousands of parts used in many different industries. In the electrical field, it finds a wide range of uses. In fact, the development of the vulcanized fibre industry has gone hand in hand with that of the electrical industry. To illustrate its adaptability for use on electrical apparatus and its wide range of utility, it is used in insulating railroad block signal joints. Here the fibre is formed into a plate and is placed in the track joint, where it is subjected to the elements and to the constant pounding of heavy locomotives and cars. Also it is used as an insulator in a small toggle switch, as a casing for an enclosed fuse, as an end lamination on a motor armature or as an ebony-like handle on an electric coffee percolator. These are just a few of the uses, but the contrast between a track insulator and a handle on a coffee percolator illustrates the versatility of the material.



Several examples of the way hard fibre is used in the making of handles for percolators, waffle irons, switches, valves, etc., are shown in the illustration above

Hard fibre bushings and other turned parts are commonly used by the electrical industry for insulating brush riggings, etc., where small insulating parts are needed

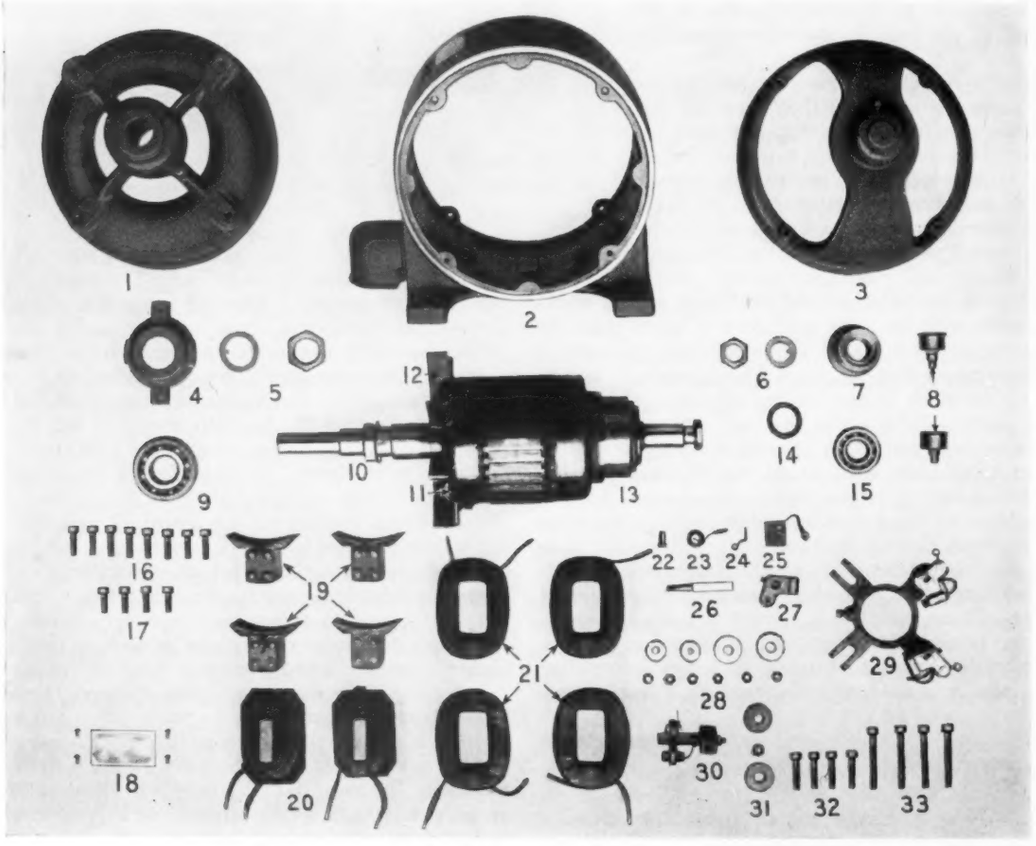
In addition to the sheets, rods and tubes, there is another grade of vulcanized fibre produced for the electrical industry. This is the product commercially known as fish paper. Fish paper is manufactured in continuous rolls from 0.005 to 0.030 in. in thickness. It is extremely tough and is used chiefly for motor and generator slot insulation. Its prime characteristics, aside from its insulating properties, are its smooth surface and its ability to withstand bending without cracking. These qualities are of particular importance to the motor manufacturers, for the reason that a brittle insulation will often crack, resulting in short circuits in motor windings. Furthermore, the hard smooth surface resists the abrasive action caused by burrs on rotor laminations.

Vulcanized fibre may be punched, stamped, turned, sawed, milled, bored, in fact, it may be machined in any manner in which it is possible to machine metal. The dielectric strength of hard fibre ranges from about 200 to 300 volts per mil. of thickness. Its compression strength is about 30,000 lb. per sq. in. and it has a tensile strength of approximately 12,000 to 15,000 lb. The specific gravity of the material is about 1.386. It is approximately one-half the weight of aluminum. One important characteristic, which makes hard fibre particularly applicable in the electrical field, is the fact that it contains no volatile matter and, therefore, it will not carbonize when subjected to an arc.

Due to the tendency of the cotton fibre, when the stock is run on the paper making machine, to arrange themselves longitudinally with the machine direction, the finished material has a distinct grain running lengthwise of the sheet. It is therefore well for the user of fibre to keep this in mind when the material is to be subjected to a bending operation. It will bend easier with the grain than across the grain. It also follows that holes near the edge of a piece should be placed, for the greatest strength, near the cut edge, that is, parallel to the grain. In some designs of solenoid spool ends, for example, a hole is punched very near the edge of the fibre. Constructing the die to punch in this manner will reduce losses due to breakage at the holes. In machining fibre, a sharp tool with plenty of clearance is of prime importance. As fibre is slightly elastic, it has a tendency to crowd against the back of the tool, which makes ample clearance essential. As a general rule, tools for cutting fibre should be ground about the same as for brass. High spindle speeds with a coarse feed will give best results for most turning operations.

Do You Know What Is in t

The motors commonly used to drive machines, line shafts, etc., are composed of many different materials and parts which are described in this article



THE user of motors and many times the motor buyer give little thought to the various parts and materials which go into a motor. Each part, of course, plays an important part and helps the motor to give more efficient service. A knowledge of these parts, their use and the material of which they are made should enable the motor buyer and the user better to judge motors and understand the operating conditions which make these parts necessary. On this and the following page the various parts of a motor of the general purpose type are illustrated and described. Some materials and parts do not admit of illustration and are described in connection with the assembled parts which they compose. The illustration above shows the parts of a direct current motor with ball bearings and commutating poles. On the following page the parts of slip-ring and squirrel-cage motors which differ from this layout are illustrated. The descriptions of these parts are listed according to the number of each part as shown in the illustrations.

1—*Back Bearing Bracket*—This piece is usually made of cast iron and contains the bearing housing.

2—*Field Frame*—The stator or field frame is either cast or forged and supports the field poles.

3—*Front Bearing Bracket*—The front bearing is held in this piece, which is more open than the back bracket to allow easy access to the commutator and brushes.

4—*Back Bearing Cap*—This part has a hole in it so that it fits around the shaft which protrudes from this end. The cap helps to keep dust and dirt out of the bearings.

5—*Back Bearing Nut and Lock Washer*—These parts are placed on the shaft to hold the bearing.

6—*Front Bearing Nut and Lock Washer*—At the right in the illustration of the armature, these parts are shown on the end of the shaft.

7—*Front End Grease Retainer*—This part is used only on the front end.

8—*Front and Back Grease Cups*—Grease cups of different sizes are used for the front and back bearings because of the shape of the housing and the different size of these bearings.

9—*Back Ball Bearing*—This bearing is the largest because it must take the major portion of the load pull.

10—*Shaft*—The steel shaft is provided with keyways, threads for the bearing nut, etc.

11—*Armature Coils*—The armature winding is composed of separate units or coils to facilitate winding and repair. Each coil consists of one or more turns of wire, insulated

the Motor You Purchase?

with cloth or some other material sufficient to withstand the impressed voltage. The various turns are then bound into one composite coil. This resultant coil is then impregnated with fluid insulating material which thoroughly penetrates to every strand of the insulation. Usually the coil sides in each slot are placed in a protecting insulating cell to prevent them from being chafed. The core is built up of sheet-steel laminations, punched to the proper size with the slot and key holes in them. These laminations are assembled or stacked together and then fastened to the shaft. In the smaller types, the laminations are fastened to the shaft directly, and in larger motors they are fastened to a spider which is fastened on the shaft. The coils are held in place in the slots with fiber or non-magnetic metal wedges. The end turns are held in place, where they are long enough to need it, by steel banding wire wound tightly over insulating paper.

12—*Fan*—The cast or malleable iron fan provides a circulation of air over the surfaces of the armature and field.

13—*Commutator*—The commutator is composed of copper bars punched to the proper shape and size and insulated with mica strips. The commutator is held to the armature by means of bolts and V-rings which bind the bars together as well as hold them to the armature core. Mica V-rings insulate the metal ones from the metallic surfaces of the commutator and core.

14—*Grease Packing*—Different sizes of this packing are used on the front and back bearings.

15—*Front Ball Bearings*—The front bearing is completely enclosed in the housing to prevent the entrance of dust.

16—*Main Field Pole Screws*—These screws hold the main poles and coils in place. Two screws are required for each pole.

17—*Commutating Pole Screws*—These poles, being smaller, require only one screw each.

18—*Name Plate*—This is made of soft metal held to the frame with small screws. It bears the serial number of the machine, its current and voltage rating, etc.

19—*Main Field Poles*—The main poles are composed of steel laminations held together by rivets.

20—*Commutating Poles and Coils*—These poles are much smaller than the main poles. The coils consist of several turns of heavy wire connected in series with the armature.

21—*Main Field Coils*—These coils consist of many turns of small insulated wire. When the coil has been wound, it is covered with insulating tape and impregnated.

22—*Brush Holder Spring Stud*—This small stud holds the tension spring in place.

23—*Brush Holder Spring*—The spring presses on the brush and holds it firmly against the commutator surface.

24—*Brush Holder Spring Adjusting Lever*—The spring tension is varied by means of this lever.

25—*Carbon Brush with Shunt*—Four sets of these brushes are required for a four-pole motor. The brushes in this case are fitted with copper shunts or pig tails which carry the current from the brush to the leads.

26—*Brush Holder Stud*—This stud holds the brush holder box to the yoke.

27—*Brush Holder Box*—The box is slightly larger than the brush to permit its sliding easily, but not large enough to allow any side play.

28—*Nuts and Washers for Brush Holder Studs*—Four sets of these are required to hold the parts of the brush rigging in place.

29—*Brush Holder Yoke*—This yoke supports all of the parts just described and is fastened to the motor frame.

30—*Complete Brush Holder*—The brush holder with studs, nuts and insulation.

31—*Brush Holder Stud Insulation*—The brush holder studs are insulated with these small washers.

32 *and* 33—*Front and Back Bearing Bracket Screws*—The back bracket screws are larger because of the strain on this end and because of a larger bracket.

34—*Wound Rotor*—A three phase type is shown. Leads from each phase winding are led out to the slip rings at the right.

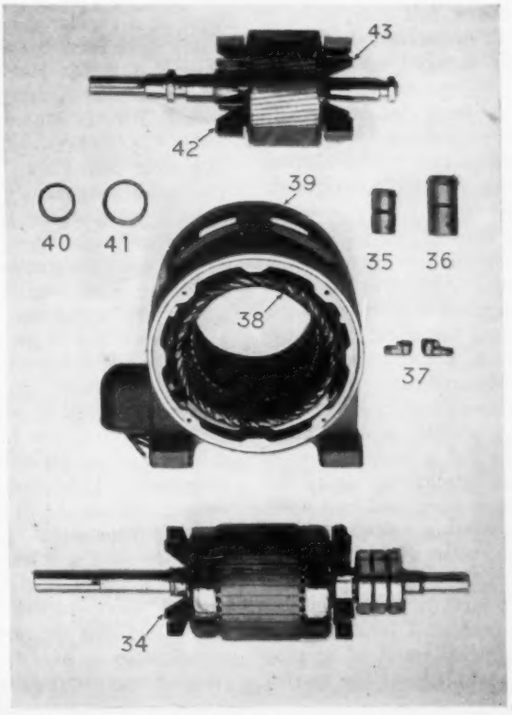
35, 36 *and* 37—*Front and Back Sleeve Bearings and Oil Cups*—Used in sleeve bearing type of motors.

38—*Stator Winding*—Used in squirrel cage and slip ring types of motors.

39—*Stator Frame*—Of cast iron. It holds laminated core.

40 *and* 41—*Oil Rings for Sleeve Bearings*—Spread oil equally.

42 *and* 43—*Squirrel Cage Rotor*—Core of steel laminations. Windings are bars welded or brazed to end ring.



What Is the Market for Motor Materials?

THE great number of motors manufactured creates a large market for raw materials and basic products, such as: copper, mica, steel and iron castings, sheet steel, steel banding wire, varnish, cambric tape, impregnating gum, fish paper, insulation fibre, carbon, paint, bearing metal, ball bearings, solder and screw machine products. According to a pamphlet issued by the Department of Commerce, the following number of motors was manufactured during 1925: 2,288,348 of the fractional horsepower type; 248,516 polyphase induction, 200 hp. and under; 1,246 polyphase induction over 200 hp.; 75,688 single phase; and 1,985 synchronous. These figures do not include motor generator sets or generators. As generators are made of the same materials as motors, it can be readily seen how large a market actually exists. The figures given above were the latest available concerning the number of machines manufactured. But in 1927 the total valuation in motors shipped was $9,248,337.

Buying Policies and Costs

(*Continued from page 9*)

and a well-known electrical manufacturer that insists upon service tests for its paint is the Stewart-Warner Speedometer Corporation.

"Because labor is the same large cost element irrespective of the grade of paint employed, it pays," points out George L. Meyer, Jr., vice-president of this concern, "to use only those grades that will best serve the purpose and keep in good condition over the longest period. Thus maintenance painting, as we see it, is pretty largely a purchasing problem. And we count tests of large importance.

"We get paint manufacturers," he continues, "to send in one-gallon samples of their paint in unmarked cans, thus avoiding any chance of favoritism being shown by our painters to whom the samples are sent to be applied to test areas. By observing the covering qualities, the ease or difficulty of application in terms of time taken and the degree to which the paint stands up in use, we have a definite measure of value upon which to purchase."

It is probably that definition of "speculate" which reads, "to form conjectures regarding anything without experiment," that most purchasing agents have in their minds when you ask them if they believe in speculating in raw materials, and it is that same definition of which they are quite likely thinking when they answer in the negative.

But this raises rather a fundamental question as to purchasing policy in a manufacturing concern. Is a manufacturer solely a converter of raw material into a finished product by the addition of mechanical and manual processing skill, and should he expect his profit entirely from such conversion service, buying his materials on the market as he finds it at the time he needs them? Or is it one of his functions to buy and sell raw materials, buying low on a favorable market and selling high?

Admittedly there are two schools of thought on this, depending to a considerable extent upon the kind of business and the proportions that exist between the values of raw material and of labor in the finished product. But the chief point is that, whatever policy is followed, it should be consciously followed. Whatever is done in the way of speculating may well be done with a full acceptance of such a policy rather than with one's eyes closed to the fact that speculating is what he is really engaged in rather than in manufacturing.

Nor does this argue that there is not a place for a little of both points of view in one's procedure. But where there is a mixture of the two viewpoints, the speculating end is likely to be explained as being merely "foresighted," as simply "protecting" oneself, and so on.

The tendency in general among manufacturers seems to be to stick to their knitting as manufacturers rather than to become traders in raw materials. And where advance purchases are made "to protect against a rising market" the period of this protection is often not great enough to warrant classifying the transaction as a speculation.

As an example, take the Belden Manufacturing Company, makers of insulated wire. Here the value of raw materials enters largely into the completed product and so there might be ample legitimate excuse for a leaning toward speculation in materials. Yet the purchasing agent explains, "We follow the market in our purchases to a small extent but not enough to call it speculating. We watch the market and protect ourselves to the extent of 60 to 90 days but never beyond that."

The Vesta Battery Corporation, already quoted in this article, is another concern where materials bulk large in the costs and yet it follows the general trend of keeping away from speculation. It takes advantage of the market up to a three-months' protection only.

As one manufacturer of motors states the case in his company: "During the last two or three years the raw material market has settled down to such an extent that the fluctuations are not great enough to warrant worrying about them. In case reports show a probable rise in the market, we try to protect ourselves by contracting for two or three months' supply, either to be called for as needed or we may take immediate delivery. The effort consumed in buying to make small speculative gains in the raw material market will bring much larger returns if directed toward a reduction of true manufacturing costs."

Perhaps after all that is the real explanation of the cause for the present trend—a realization that manufacturers are manufacturers and that they can make the largest profits by focusing on fabricating a product rather than upon guessing the market.

Most of today's problems of buying among the manufacturers are those which concern the getting of the right quantity, of the right quality and getting delivery as near as possible but not too far ahead of the time when needed. In other words, the most useful buyer is the one who is cooperating to the fullest extent with all the other manufacturing executives in the joint task of pushing production along to the end that the time gap will be as small as possible between materials received and goods shipped. The result is—ever a quicker and quicker turnover.

Good Conductors or Insulators?

(*Continued from page 32*)

is when quality happens to be the most important objective, and at a time of increasing the force, the subject of breaking in new men may deserve special treatment. If the accident rate has taken a bad turn, the whole safety subject should be emphasized in the foremen's meetings. If some new company policy or standard practice is to be inaugurated, it becomes a fitting subject for presentation and discussion in the foremen's meetings.

At the Ward Leonard Electric Company we have been guided by the principles that I have already presented. We have divided our foremen up into groups of twelve to fourteen men each. Each group meets for one hour each week at a regularly scheduled time.

We have been discussing such subjects as "How a Foreman Can Reach His Men," "Planning the Work," "The Importance of Quality Production," "The Foreman's Responsibilities as Management's Representative," "Why New Men Are Expensive," "What Foremen Can Do to Cut Waste in Our Plant," "The Cost of Accidents" and "The Executive Responsibilities of a Foreman in Our Company."

In order that the fruits of our discussion may be preserved, we make up a careful summary of the conclusions arrived at by the combined judgment of the discussion groups following each weekly series of meetings. These summaries are reproduced and distributed to each foreman and executive in the organization so that each may have a complete file of the important conclusions arrived at.

We have gone further than the foremen and have organized a special group composed of the factory manager, chief inspector, the head draftsman, the traffic manager, the head of the planning department and the several superintendents. This group is the first group to tackle each subject discussed. We think of this group rather as a steering committee. It also affords an excellent opportunity to tie the intermediate executives into the program in such a way that the meetings with the foremen can accurately carry out the most vital needs of the organization.

We feel that the work we are doing with our foremen organization is an essential function which we, as a progressive organization, must perform. We want a real "conductor"—no "insulators"—in charge of every department.

New Goods—for Your Inspection

A department for the description of new devices, parts, materials and special tools for use in the manufacture and repair of electrical products

Switch Start Motors

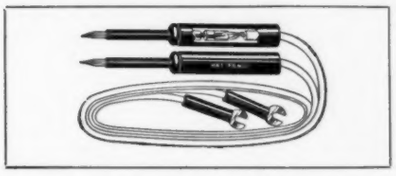
Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, has brought out a line of switch start motors in sizes ranging from ½ to 30 hp. for either 2 or 3 phase, 60 cycles. These motors are designed to be started directly across the line without the use of a starting compensator, resistance or other voltage reducing mechanism and without exceeding the starting current requirements of the N. E. L. A. These motors are designed to operate with equal or better efficiency and 5 to 10 points higher power factor than the ordinary self-starting motor. Welded steel construction is used and the motors are furnished with sleeve bearings unless ball bearings are requested.

Muter Audichoke

Leslie F. Muter Co., Seventy-sixth St. and Greenwood Ave., Chicago, has brought out the Muter Audichoke, an audio frequency choke coil designed to eliminate regeneration between stages of the audio amplifier. This unit is a complete choke coil and 1 mfd. condenser. The coil has a D. C. resistance of 445 ohms, to make the drop across the choke negligible. The effective inductance of the choke is approximately 100 henries when used with a 201A tube. It is designed to be used with tubes having plate currents up to 15 milliamperes without becoming ineffective at any frequency.

Meco Test Handles

Metropolitan Mfg. & Electric Co., 1163 Sedgwick St., Chicago, announces a set of test handles which may be obtained



either alone or complete with leads. These handles are heavily insulated, both on the handles and the metal down to the points. Design of the handles makes for easy replacement of the wire leads. The points are of cadmium and resist rust and acid. Terminals are provided for connection to the house current. No solder is required in replacing the leads.

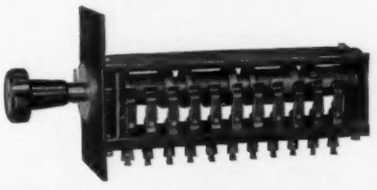
Sterling Motor

Sterling Electric Motors, Inc., Telegraph Road and Atlantic Ave., Los Angeles, Cal., has brought out the Sterling Klosd Cros-Line starting general purpose motor. This motor is available in sizes of ¼ to 30 hp. in all speeds. The motors operate from either 220 or 440 volts by a special system

of external connection changing. All sizes are equipped with ball bearings. The motor is completely inclosed and ventilated by a method designed to eliminate hot spots.

Instrument and Control Switches

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces type W line of instrument and control switches. This switch can be used for connecting any instrument or group of instruments selec-



tively to various circuits as may be required for metering, synchronizing or other switching functions. The turning of the switch handle operates a shaft on which are mounted contact making segments. These segments make or break contact with stationary fingers mounted on an insulated base. It is readily mounted on any commercial thickness of panel. A Micarta sliding cover on each side makes the housing dust tight. Six standard lengths are available and all switches are insulated for 600 volts A.C. or D.C. The contacts will carry 10 amps. continuously and will open 5 amps. under normal conditions.

Bryant Heater Switch

Bryant Electric Co., Bridgeport, Conn., announces Model No. 6279 heater switch. It has a reversible rotation with indicating handle and nickel silver angle cover with raised polished indication on a black japanned background. It is a single-pole, three-heat switch and is rated at 20 amp., 125 volts, or 10 amp., 250 volts.

Wilcolator Relay

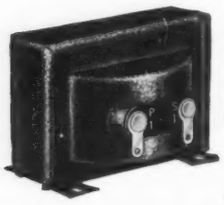
Wilcolator Co., 17 Nevada St., Newark, N. J., has placed on the market a relay for use with three-wire control circuits with thermostats or other pilot means. It is built for A.C. only and is furnished for ratings of 110 volts, 25 or 60 cycles at 30 amps., and 220 volts, 60 cycles at 15 amps. The base measures 3½ by 4½ in. high and is provided with four mounting holes. Silver contacts are provided for carrying the main load current. This relay is designed for use on non-inductive circuits only.

Condenser Group

Precise Mfg. Co., 254 Mill St., Rochester, N. Y., is marketing Model No. 2100, condenser group. This assembly is fitted with mounting brackets and is available with one, two, three or four condensers in the gang. The condensers have removable shafts and are fitted with a compensating device for adjusting the minimum capacity. The rotors are driven from the drum dial by a friction drive. The drum dial is graduated in numbers 0-100 and has approximate kilocycle markings at

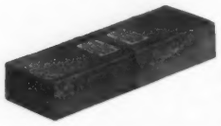
the side. The name plate may be obtained with or without the Precise marking. Condensers of 0.00025, 0.00035 and 0.0005 are available for any of the gang assemblies.

Airex Audio Transformers



Airex Co., 797 Greenwich St., New York, has placed on the market Airex, Type M, line of shielded audio frequency transformers. These transformers are equipped with soldering lugs on terminal posts. The case is finished in crystalline black and has screw mounting lugs. Any type and size of transformer is made in this line. Type U is also available with leads instead of terminals.

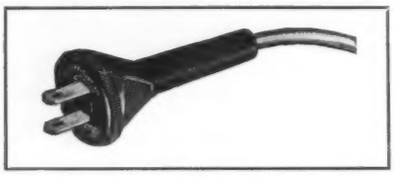
Commutator Stone



Martindale Electric Co., 1262 W. Fourth St., Cleveland, announces its Double Duty commutator and slip ring stone. One end is made of coarse abrasive material for cutting, and the other end is composed of fine material for the finishing operations. These stones are made in various convenient sizes for carrying in the pocket or tool kit.

Soft Rubber Plug

Belden Mfg. Co., 2310B S. Western Ave., Chicago, has brought out a soft rubber attachment plug, ruggedly constructed of solid soft rubber and shaped



to form a convenient grip for the fingers. It is made in different shapes for various uses and is sold only as part of Belden cord service. Cords with these plugs are furnished in 10, 20 and 50 ft. lengths.

L-A Totally Enclosed Motors

Louis Allis Co., Milwaukee, Wis., is marketing the type HDR line of totally inclosed, externally ventilated, ball-bearing, squirrel-cage motors in sizes of 3 to 40

hp. These motors are designed to be dust and vapor tight. The motor is inclosed by solid cast bearing brackets, and one end of the shaft has a ventilating fan. This sealed motor and the fan are placed inside a cylindrical housing. Air is taken into the motor at the left in the illustration, passes over the surface of the inclosing brackets and comes out at the shaft end. Since the cooling air does not reach the interior of the motor, it is not essential that the air be clean. This type of motor is also available for self-starting without the use of a compensator in sizes of 7½ to 25 hp.

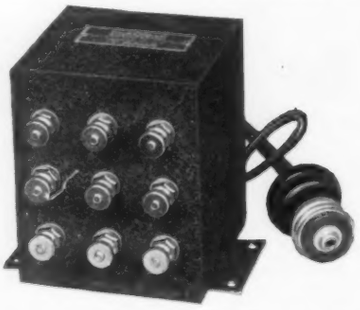
Enclosed Circuit Breakers

Roller-Smith Co., 239 Broadway, New York, has brought out Types ESF, ES and EI inclosed circuit breakers. Types ESF (free handle) and ES are made in capacities of 5 to 800 amp. at potentials

up to 600 volts A. C. to D. C. One, two, three and four pole models are available with overload and under-voltage protection and instantaneous and time-limit trip. Type EI is made in capacities of 5 to 100 amps. for potentials up to 250 volts A. C. or D. C., with overload and under-voltage protection and instantaneous trip features. A Type ESF, 80-amp., 250-volt., three-pole, rigid arm circuit breaker with overload protection and time-limit trip is illustrated.

Filament Transformer

Scanlan Electric Mfg. Co., 1113 N. Franklin St., Chicago, has brought out a filament transformer for use with sets using no more than 6 Type 226 tubes, one



Type 227 tube, and 2 Type 171 tubes. Center taps are provided so that the use of center tapped resistances for grid biases will not be needed. A loop of one side of the 110 volt primary is brought out from the case so that a panel mounted switch may be connected to it, if desired. The crackle finished case is 3½ by 4 by 4 in.

Oil Burner Pump

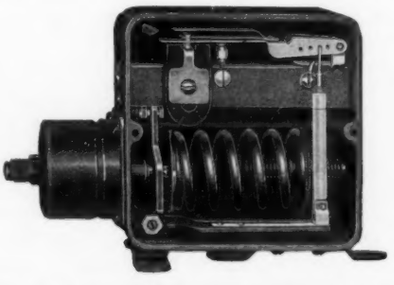
Teesdale Mfg. Co., 427 Market Ave., Grand Rapids, Mich., has placed on the market Type TU, Teesdale automatic oil burner, designed to permit the outside storage of fuel. The pump is anti-siphoning, vapor tight, and the case surrounding it holds 1½ gal. of oil, making a storage tank in the basement unnecessary. The motor is controlled by a mercury switch, and oil-proof cork floats start and stop the flow of oil. This pump is designed to lift over 20 ft. of oil and deliver up to 30 gal. per hour. It consumes 40 watts.

Soldering Lugs

H. B. Sherman Mfg. Co., Battle Creek, Mich., has placed on the market a line of heavy-duty soldering lugs made of seamless copper tubing. These lugs are furnished with one, two or four bolt holes in the tongue or special numbers and sizes of holes if desired. Special finishes and special dimension lugs are also available in this type. The lugs are usually furnished straight, but, if desired, 45 and 90 deg. lugs can be furnished on order.

Penn Magnet Switch

Penn Electric Switch Co., Twelfth and Walnut Streets, Des Moines, Iowa, has placed on the market the type L Penn magnet switch for temperature pressure or vacuum service. This switch is furnished to either open or close an electric circuit



with a change of pressure, vacuum or temperature. It is designed for applications which require a small difference between the open and close positions. The differential on temperature can be varied from a minimum of 2 deg. to a maximum of 8 deg. For pressure the differential can be varied from a minimum of 1 lb. to a maximum of 5 lb. It consists of a permanent magnet working in conjunction with a movable armature which is actuated by a sylphon bellows. It can be used on domestic and commercial refrigerators, oil burners, water pumps, electric heaters, unit heaters, signaling devices and many other applications where such control is needed.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore. This Classified Index has been an exclusive ELECTRICAL RECORD feature for over thirty-six years.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.

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ARMATURE
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Banding Machines. See Banding Machines, Armature.
Bearings. See Bearings.
Blowers. See Blowers, Armature.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils Finished.
Core Punchings. See Discs, Armature.
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Lifts. See Lifts, Armature.
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Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
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Torpedo Cord. See Twine, Armature Winding.
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Winding Machines. See Winding Machines, Armature & Field Coil.
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Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville, Inc., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Deceleco, Inc., Wayne, Mich.
Johns-Manville, Inc., New York, N. Y.
Transite. See Johns-Manville, Inc
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines)
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbus Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper

BARS, Commutator
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Motor Platform
Tension Motor Base Co., 15 E. 26th, New York, N. Y.

BASES, Reading Lamp
Metal, Pottery Wood.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.

Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
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BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
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BATTERY SALTS. See Chemicals, Battery.
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BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 24 William, Chattanooga, Tenn.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1133 Race, Philadelphia, Pa.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

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Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Braun Bearings Co., Primos, Pa.
Fafnir Bearing Co., New Britain, Conn.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Marlin-Rockwell Corp., Jamestown, N. Y.
Hoffman. See Norma-Hoffman Bearings Corp.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Arguto Oilless Bearings Co., Philadelphia, Pa.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Cleveland Graphite Bronze Co., Cleveland, Ohio.
Nevoil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
More-Jones Brass & Metal Co., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.

BOX BOARD
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.

BRUSHES *for* **ELECTRICAL MACHINERY**
Shipment within 12 hours
Carbon and Graphite Products Co.
227 West Broadway, New York City
Phone: Walker 4124

BOXES, Fibre
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Corrfibre. See Container Corp. of America.

BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., Front & Willow Sts., Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Hinde & Dauch Paper Co., 314 Water, Sandusky, O. (Wrappers.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.
Thompson & Norris Co., 212 Concord, Brooklyn, N. Y.

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BRASS TUBING. See Tubing, Brass and Copper.

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Sheet, Rod, Bar.
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
Baltimore Copper Smelting & Rolling Co., Baltimore, Md.
Scovill Mfg. Co., Waterbury, Conn.

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BRUSHES, Carbon. See Brushes, Commutator.
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Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
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Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W
Automotive Mfg. Co., Kansas City, Mo. ..... H . .
B. B. B. See Becker Bros. Elec'l Corp.
Baylis Co., Bloomfield, N. J. ..... H . .
Becker Bros. Elec'l. Corp., 25 N. Jefferson, Chicago, Ill. ..... C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. ..... C . . . . . .
Boston Woven Wire Brush Co., Northboro, Mass. ..... W . . . . .
Boxill-Bruel Carbon Co., 308 W. Fourth, Cincinnati, O. ..... C . . . H . .
Burrows & Co., 1135 W. Van Buren, Chicago ..... C W S H I
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C . . . . . .
Carbon Engrg. Co., 1700 8th Ave., Milwaukee, Wis. ..... C L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. ..... C . . . . . .
Carbon & Graphite Products Co., 227 West Broadway, New York, N. Y. ..... C . . . . . .
Carenco. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. ..... C W S . . L
Cooley Mfg. Co., 98 Park Place, New York . . W . . . . .
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City ..... .
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa. ..... H . .
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa. ..... .
Eureka Copper Products Corp., North East, Pa. ..... W S H . .
Fleck Carbon Co., 508 Broome, New York C . . . . . .
Flower, D. R., 1217 Spring Garden, Philadelphia, Pa. ..... H . .
General Electric Co., Schenectady, N. Y. .... C . . . H L
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Graphite Metalizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. ..... C . . . H . .
Henrite Products Co., 98 Park Place, New York, N. Y. ..... C . . . . . .
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio ..... H . .
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) ..... C . . . . . .
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C . . . . . .
Kohlenite Products Co., 417 W. 28th, New York, N. Y. ..... C . . . . . .
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 3608 Grand Central Terminal, New York, N. Y. C . . . . . .
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C . . . . . .
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y. ..... C . . . . . .
National Carbon Co., Cleveland, O. ..... C . . . . . .
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L

BRUSHES, Commutator—Continued
No Spar. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8219 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O..... W . . . . .
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C . . . . . .
Pure Carbon Co., Wellsville, N. Y..... C W S . . L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... W L
Salem Electrical Supply Co., Salem, Mass. . . W . . . . .
Seabury, Ralph L., Factories Bldg., Toledo, O. C . . . . . .
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo..... C . . . . . .
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y..... C L
Speer Carbon Co., St. Mary's, Pa..... C . . . . . .
Stackpole Carbon Co., St. Mary's, Pa..... C . . . . . .
Sterling. See Carbon Laboratories Co.
Superior Carbon Products, Poughkeepsie, N. Y. ..... C . . . . . .
U. S. Graphite Co., Saginaw, Mich..... C . . . . . .
Unico. See Universal Carbon Co.
Universal Carbon Co., Dundee, Ill..... C . . . . . .
Universal. See Graphite Metalizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Co., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.
BUNCHING MACHINES. See Wire Manufacturing Machines.
BUSHINGS, SHAFT. See Bearings and Bushings.
CABINETS, Ice Cream. See Refrigerator Cabinets.

CABINETS, Fibre

Diamond State Fibre Co., Bridgeport, Pa.
Vulcawood. See Diamond State Fibre Co.
CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel Equip. Co., Aurora, Ill.
American Elec. Switch Co., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 555 W. Monroe, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1605 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Diamond C. See Standard Elec. Supply Co.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Box & Switchboard Co., 500 S. Thorp, Chicago.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 702 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Haner, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 221 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dail Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
MacMillen, John W., 201 N. Los Angeles, Los Angeels, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezloh. See Holzer Sheet Metal Works.
Security. See Aurora Steel Products Co.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
States Elec. Mfg. Co., 703 Plymouth Ave., N., Minneapolis.
Superior Switchboard & Devices Co., 420 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 144 Bleecker, Newark.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Brannin Cabinet Co., 162 Chambers, New York, N. Y.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chicago Phonograph Mfg. Co., 5127 S. State, Chicago, Ill.
Chillicothe Furniture Co., Chillicothe, Mo. (Radio.)
Churchill Cabinet Co., 2119 Churchill, Chicago, Ill.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Cook Co., C. A., 18 Osborn, Cambridge, Mass.
Crescent Chair Co., Plymouth, Wis.
Delker Co., Geo., Henderson, Ky.
Detroit Woodcraft Corp., 2260 Hendrie, Detroit.
Donohue Lumber Co., Smith and State, Perth Amboy, N. J.
Ebco Radio Cabinet Corp., 410 W. 27th, New York, N. Y.
Eflein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Elgin Phonograph & Novelty Co., Elgin, Ill.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4820 W. 16th, Cicero, Ill.
Express Body Corp., Crystal Lake, Ill.
Harper Mfg. Co., Casopolis, Mich.
International Equipment Co., 1326 Chestnut Ave., Kansas City, Mo.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Jesse Mfg. Co., John O., Bryan, O.
King Mfg. Corp., Rano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Lund Corp., I. A., 1018 S. Wabash Ave., Chicago, Ill.
Morris Register Co., Council Bluffs, Ia.
Natural Voice Talking Mach. & Radio Cabinet Co., Oneida, N. Y.
New England Box Co., Greenfield, Mass.
Panelcab. See Weber Electric Wks.
Parker-Young Co., 131 State, Boston, Mass.
Pierson Co., 836 Cedar, Rockford, Ill.
Plymouth Furniture Co., 25 E. Juneau, Milwaukee, Wis.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pillied Lumber Co., Swanton, O.
Radio Master Corp. of America, Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Robbins Woodworking Co., Libertyville, Ill.
Roberts & Co., H. T., 1340 S. Michigan Ave., Chicago, Ill.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Signal Electric Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Standard Piano Bench Mfg. Co., 1221 W. Lake, Chicago, Ill.
Stradivara Co., Coshocton, Ohio.
Straus Cabinet Wks., Eugene, Baxter Ave., Louisville, Ky.
Stettner Phonograph Corp., 318 E. 75th, New York.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Swan & Sons, S. N., 1st, Freeport, Ill.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
United Cabinet Mfrs. Corp., 1615 S. Michigan Blvd., Chicago, Ill.
United States Motors Corp., Oshkosh, Wis.
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Mo.
Watsontown Table & Furniture Co., Watsontown, Pa.
Weber Electric Wks., Brooklyn Sta., Cleveland, O.
West Box Co., 235 Liberty, Springfield, Mass.
Windsor Furniture Co., 1422 Carroll Ave., Chicago, Ill.
CABLE ARMORING MACHINES. See Wire Manufacturing Machines.
CABLE TEST SETS. See Instruments, Portable and Switchboard.
CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., Wilmington, Del.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Phoenix Glass Co., 230 5th Ave., New York, N. Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.
CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.
CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
CARTONS. See Boxes and Wrappers.
CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1270 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Bohn Aluminum & Brass Corp., 2599 Isabella, Detroit, Faries Mfg. Co., Decatur, Ill.
Sterling Art Metal Wks., 61 Grand, New York, N. Y.

CASTINGS, Die

Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Olive Bldg., Pittsburgh.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., Court & 9th, Brooklyn, N. Y.
Milwaukee Die Casting Co., Milwaukee, Wis.
Newton Die Casting Corp., New Haven, Conn.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Stewart Mfg. Co., 4509 Fullerton Ave., Chicago, Ill.

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
North Wales Mach. Foundry Co., North Wales, Pa.
Snead & Co., Pine St., Jersey City, N. J.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.

CASTINGS, Steel

Eastern Steel Casting Co., Ave. L & Edward St., Newark, N. J.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Acme. See Green Equipment Corp.
Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis, Minn.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
Peree-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Airlox Rubber Co., 6807 N. Clark, Chicago, Ill.
Carricite. See Airlox Rubber Co.
Fire Lute. See Technical Products Co.
Fuselle. See Airlox Rubber Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.

CHAIN, Bead

American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
United Bead & Chain Co., Irvington, N. J.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
McKinnen Chain Co., Tonawanda, N. Y.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.
Waterbury Mfg. Co., Waterbury, Conn.

CHAIN, Power Transmission

Baldwin Chain & Mfg. Co., Worcester, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Whitney Mfg. Co., Hartford, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Equipment Co., 1240 S. Hope, Los Angeles, Cal.
Fore Elec. Mfg. Co., 6255 Wabada Ave., St. Louis, Mo.
Serrwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein & Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
New Jersey Zinc Co., 160 Front, New York, N. Y. (Zinc Chloride.)
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltak. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)

CHUCKS, Magnetic

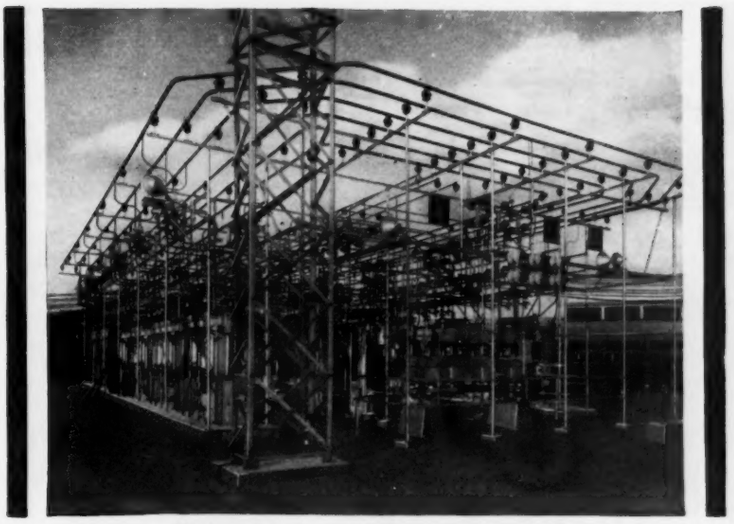
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 389 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
High Tension Elec'l Specialty Co., Copley Square, Boston.
Hilesco. See High Tension Elec'l Specialty Co.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Ward Leonard Elec. Co., Mount-Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.



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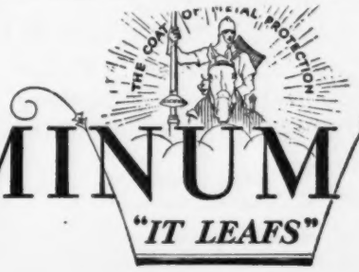

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CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros Co., Piano, Ill

CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH AND PAPER, Insulated

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) .... See B
Silk ..... See S

Acme Wire Co., Dept. K, New Haven, Conn. C S P . . . .
Armatite. See Mica Insulator Co.
Brand & Co., Wm., 268 Fourth Ave., New York ..... P . . . .
Campbellite. See Campbell Fibre Co.
Campbell Fibre Co., Stanton, Delaware..... B
Carboloid Products Corp., Hastings-on-Hudson, N. Y. ..... C . . P . . . .
Case Brothers, Inc., Highland Park, Conn.. . . . . B
Case & Risley Press Paper Co., Oneco, Conn. . . . . .
C-F. See Campbell Fibre Co.
Chicago Mica Co., Valparaiso, Ind..... C . . . . . .
Dexstar. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)
Diamond State Fibre Co., Bridgeport, Pa.. . . . P . . . .
Dielectric Mfg. Co., St. Louis, Mo..... C S P . . B
Federal Insulating Corp., Yonkers, N. Y.... C . . P F
General Electric Co., Schenectady, N. Y.... C . . P . . .
Hewitt & Bros., C. B., 16 Ferry, New York C . . P . . . .
Hi-Tex. See Stevens Paper Mills.
Incella. See Tarentum Paper Mills Co.
Irvington Varnish & Insulator Co., Irvington, N. J. ..... C S P . . .
Manning Paper Co., J. A., Troy, N. Y.... . . . . B
Mica Insulating Co., 200 Varick, New York C S P . . B
National Vulcanized Fibre Co., Wilmington, Del. ..... F . .
New Jersey Wood Finishing Co., Woodbridge, N. J. ..... C . . . . . .
Old Hick. See Hewitt & Bros., C. B.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass. . . . . F . .
Rogers Paper Co., South Manchester, Conn. . . . . B
Schweitzer, Peter, 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Scutan Co., 342 Madison Ave., New York . . . . P . . . .
Sico. See Standard Insulation Co.
Spaulding Fibre Co., Tonawanda, N. Y.... . . . . F . .
Standard Insulation Co., Rutherford, N. J. C S P . . . .
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varlsed Hard Fibreboard)..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn..... B
Tarentum Paper Mills Co., Tarentum, Pa.... P . . . .
Turbonite. See Brand & Co., Wm.
West Virginia Pulp & Paper Co., 200 5th Ave., New York..... B

CLUTCHES, Magnetic

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

COIL (Coils).

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished

Armature, Field, Electromagnet and Induction Coils.
Acme Wire Co., Dept. K, New Haven, Conn.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York, N. Y.
A. A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Coilton Elec. Mfg. Co., Easton, Pa.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 2101 Federal, Camden, N. J.
Electrical Products Mfg. Co., Providence, R. I.
Irvington Varnish & Insulator Co., Irvington, N. J.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 8 Centre, Newark, N. J.
Niehoff & Company, C. E., 230 W. Superior, Chicago, Ill.
Pifer Elec. Repair & Mfg. Co., 1392 E. 43rd, Cleveland, O.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.

Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Sevison Magneto Engrg. Co., 538 Fernwood Ave., Toledo, O.
Stunz & Barron, 210 E. Pratt, Baltimore, Md.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Universal Winding Co., Boston, Mass.
U. S. Armature Service Co., 1617 S. Michigan Ave., Chicago, Ill.
Whittier & Ditmar, Inc., 1611 Beacon, Brookline, Mass.

COMMUTATOR

Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS

Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor

Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electric Controller & Mfg. Co., 79th & Woodlawn Ave., S. E., Cleveland, O.
Electrite. See Sundh Elec. Co.
Diamond Elec. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 292 Hudson, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Co., H., 247 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholene. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
U. S. Elec'l Mfg. Co., 200 E. Slauson Ave., Los Angeles.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

CORES, RESISTANCE COIL (Lava)

American Lava Corp., 24 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)

American Lava Corp., 24 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Firelte. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreomil. See Thermal Syndicate.

COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)

Bartlett Hayward Co., Baltimore, Md.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Lipe, W. C., Syracuse, N. Y.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease

Bowen Mfg. Co., Auburn, New York.
Lunkenheimer Co., Cincinnati, Ohio.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier

Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschburg, Stutz & Co., 268 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer)
Noe & Sons, Wm. R., 43 E. 10th, New York, N. Y.
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia.
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA

Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS

Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

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DIALS, Enameled

Whittier Co., Horace R., Pequabuck, Conn.

DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS

Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Beaver Machine & Tool Co., Dept. M4, Newark, N. J.
Chicago Cutting Die Co., 1417 Altgeld, Chicago, Ill.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.

DISCS, Armature

Steel Discs, Laminations, and Segments for Motors and Transformers.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES

Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., 407 Spitzer Bldg., Toledo, O.
Preis, & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel

Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Graph Corp. See Insuline Corp. of America.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., Newark, N. J.
Roselle Mfg. Co., 215 E. 9th Ave., Roselle, N. J.
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 12th and Sycamore, Cincinnati, O.
Wright Radio Co., 114 Exchange, Rockland, Mass.

ENGRAVING TO ORDER. See Engraving, Radio Panel.

EYELETS

Platt Bros. & Co., Waterbury, Conn.

FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.
FEET, FELT. See Felt.

FELT

Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4031 Ogden Ave., Chicago, Ill.

FERRULES

Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)

Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol

Moisture Proof; Sheet, Rod, Tubes.
Bakelite-Dilecto. See Continental Fibre Co.
Bakelite-Duresto. See Spaulding Fibre Co.
Celeron Co., Bridgeport, Pa.
Continental Fibre Co., Newark, Del.
Fibroc Insulation Co., 423 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

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Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Agasote Millboard Co. (Fernwood), Trenton, N. J.
Brandywine Fibre Products Co., North Walnut St., Wilmington, Del.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Conite. See Continental Fibre Co.
Cocheco. See Spaulding Fibre Co.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Diamond State Fibre Co.
Diamond State Fibre Co., Bridgeport, Pa.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Agasote Millboard Co.
Fibro Products Co., New Bedford, Mass.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 2359 E. 67th, Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmold. See Wilmington Fibre Specialty Co.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Diamond State Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 14th and Willow Ave., Hoboken, N. J.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1264 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ... H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) ... B
American Pin Co., Waterbury, Conn. ... I
American Ring Co., Waterbury, Conn. (Candle.) ... S
Ampinco. See American Pin Co.
Anderson Co., Jacob, 258 3rd Ave., So. Minneapolis, Minn. ... B
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ... B I
Arco. See American Ring Co.
Arrow Electric Co., Hartford, Conn. ... S
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barber Brass Wks., 3627 Superior, Detroit. ... B
Belmet. See B. & L. Metal Stamping Co.
Block Bros. Mfg. Co., 89 Walker, New York. ... B
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. ... B
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ... B I
Bryant Elec. Co., Bridgeport, Conn. ... S
B. & L. Metal Stamping Co., 155 Jamaica Ave., Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ... B I ... H
Cambridge Brass Co., Cambridge, Mass. ... B
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ... B ... S
Crescent Brass Mfg. Co., Reading, Pa. ... B
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ... S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) ... B I
Dunlap Co., John, Carnegie, Pa. ... S
East Side Metal Spinning Co., 451 Groenwich, New York, N. Y. ... B
Economy. See National Metal Molding Co.
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. ... B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago. ... I
Fralick Co., S. R., 15 S. Clinton, Chicago. ... I
Franklin Brass Foundry Co., Reading, Pa. ... B
Friedley-Voshardt Co., Chicago. ... B
Full-O-Lite Co., 723 S. Halstead, New York, N. Y. ... B
General Electric Co., Schenectady, N. Y. ... S
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. ... I
Guth Co., Edwin F., 2625 Washington Ave., St. Louis, Mo. ... S
Hart & Hegeman Mfg. Co., Hartford, Conn. ... S
Hyman & Co., H., 222 W. 14th, New York. ... B ... S
Incandescent Supply Co., 468 West Broadway, New York, N. Y. ... B ... H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Jones Brass & Iron Specialty Co., 1820 W. 22nd, Chicago, Ill. ... B I
Kesco Mfg. Co., 92 Montgomery, Jersey City, N. J. ... B
Kescolite. See Kesco Mfg. Co.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Lanco Mfg. Co., 233 Jeliff Ave., Newark, N. J. (Cross Bar.) ... I
Liberty Brass Turning Co., 203 Lafayette, New York, N. Y. ... I
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ... B I

Liberty Machine Co., Wauwatosa, Wis. ... B I
L. & W. Brass Wks., 830 Orleans, Chicago, Ill. ... B
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. ... I
Macallen Co., Foundry St., Boston, Mass. ... I
Manhattan Brass & Elec. Co., 30 Warren, New York, N. Y. ... B
Metal Products Co., 210 Canal, New York. ... B
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ... B
Mid-West Chandelier Co., Kansas City, Mo. ... B
Mitchell-Vance Co., 503 W. 24th, New York. ... S
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. ... B I
National Metal Moulding Co., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) ... I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. ... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. ... B
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. ... I
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. ... B ... S
Peerless Products Line, 200 Holliday, Baltimore, Md. ... B ... H
Perfeclite Co., 1457 E. 40th, Cleveland. ... S
Pittsburgh Valve & Fittings Co., Barberton, O. ... I
Plume & Atwood Mfg. Co., Waterbury, Conn. ... B ... S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Puritan Lighting Fixture Co., 299 Wallabout, Brooklyn, N. Y. ... B ... H
Reading Brass Co., 141 Schiller, Reading, Pa. ... B I
Red Spot. See Wakefield Brass Co., F. W.
Rodale Mfg. Co., 200 Hudson, New York. ... B ... H
Safety Unit & Mfg. Co., 9312 Cassius Ave., Cleveland, O. ... S
Sandow Tool Co., 1440 Broadway, New York ... S
Schroeder Lamp Wks., Jersey City, N. J. ... B
Scovill Mfg. Co., Waterbury, Conn. ... B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Smoot-Holman Co., Inglewood, Cal. (Ceiling Reflectors) ... B
Snapover. See Safety Unit Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia. ... B
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ... S
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ... B
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. ... I
Steele & Johnson Mfg. Co., Waterbury, Conn. ... B ... S
Stelco. See Standard Elec. & Mfg. Co.
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ... B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. ... I
Triumph Mfg. Co., 310-13, West New York, N. J. ... S
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Co., also Pass & Seymour.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ... B
Vandy, B. V., 7 Prospect St., Rochester, N. Y. ... H
Vester, Sons, Alfred, 5 Mason, Providence, R. I. ... B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ... B
Walden Tool & Metal Mfg. Co., New Haven Conn.
Wa-Me-Co. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. ... B
Waterbury Mfg. Co., Waterbury, Conn. ... B ... S
Waterbury Metal Wares Co., Waterbury, Conn. ... S
Weber Brass Co., Whitney Power Block, Cleveland, O. ... B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. ... B ... S
Zamora. See American Pin Co.

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 706 Russia, San Francisco, Cal.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Diamond. See General Appliance Corp.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Outdoor Adv. Co., 1028 Carnegie Ave., Cleveland.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 292 Hudson, New York, N. Y.
Hotchkiss. See Cramblet Engineering Corp.
Jimbetts. See Betts, Inc., James H.
Killark. See Betts & Betts Corp.
Magnetic Sign Flasher Co., Seattle, Wash.
Mercury. See Betts, Inc., James H.
Norden Co., 132 W. 43rd, New York, N. Y.
Opalume Sign System, Battle Creek, Mich.

The Simplex Refillable
FUSE PLUG
The plug that can be refilled with standard fuse wire.
F. W. POWELL
119 W. Ohio St., Pittsburgh, Pa.

Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products, Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Puritan Elec. Circuit Breaker Corp., 1 E. 42nd, New York.
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2622 W. Congress, Chicago, Ill.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.
FLEXIBLE SHAFT. See Tubing, Flexible Metallic.

FORGINGS, Non-Ferrous
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comatock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Timberlake & Sons, J. B., Jackson, Mich.
Watral & Sons, 133 E. 16th, New York, N. Y.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS
Sherman Mfg. Co., H. B., Battle Creek, Mich.

FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ... P
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Co., Hartford, Conn. ... P N
Atlantic Elec. Goods Co., 81 Murray, New York, N. Y. ... C P
Automatic Elec. Iron & Fuse Co., 12 S. Orianna, Philadelphia, Pa. ... P
Belden Mfg. Co., 2310B, S. Western Ave., Chicago, Ill. ... C
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis. (Automobile) ... C P N R O
C. E. Z. See Automatic Elec. Iron & Fuse
Chase-Shawmut Co., Newburyport, Mass. ... C P N R O
Chicago Jefferson Fuse & Electric Co., 1505 W. 15th, Chicago, Ill. (Automobile) ... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ... C N R
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ... C R
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ... C P N R
Eco. See Economy Fuse & Mfg. Co.
Efficiency Fuse Co., East Palestine, O. ...
Electric Fuseguard Co., Charlottesville, Va. ... C P N R
Elliott Electric Co., Shreveport, La. ...
Federal Elec. Co., 3700 S. State, Chicago. ... C P R
Gem. See Chicago-Jefferson Fuse & Electric
General Electric Co., Schenectady, N. Y. ... C N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. ... C
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ... C R
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. ... P R
Hudson Wire Co., Ossining, N. Y. ... O
Kantark. See Trico Fuse Mfg. Co.
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. ... C
Merrill Mfg. Co., 50 State, Boston, Mass. ...
Monarch Fuse Co., Jamestown, N. Y. ... C N R
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y. ... C P R
Platt Bros. & Co., Waterbury, Conn. ... O
Powell, F. W., 119 W. Ohio, Pittsburgh. ... P R
Ree-Nu-It Elec. Co., New Bedford, Mass. ... C P R
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. ... C R
Royal Elec. Co., Chelsea Station, Boston. ... P N
Sig-In-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. ... C P R
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ... C P N R
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING
Cattle & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS. See Instruments, Laboratory Standard.

GASKETS, Rubber
Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

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More Durable than Rock"

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Bells and Signals
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Coils
Controls
Dynamos
Electric Appliances
Electric Machinery
Electrical Instruments
Electric Fans
Fire Alarms
Heat Regulators
Instrument Boards
Insulators
Ignition (Oil Burners)
Lighting Plants
Magnets
Motors (Electric)
Plating Machinery
Radio
Railroad Equipment
Regulators
Signal Systems
Signs
Switches
Telephones (Automatic)
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Transformers
Vacuum Cleaners

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Change in gauge	.001
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FIBROC

GAUZE BRUSHES, Wire. See Brushes, Commutator.

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Cleveland Worm & Gear Co., Cleveland, Ohio.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Machine Co., Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Heli-Spur. See Horsburgh & Scott.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Philadelphia Gear Wks., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Delaware Hard Fibre Co., Wilmington, Delaware.
Diamond State Fibre Co., Bridgeport, Conn.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Berylite. See Plaut & Co., L.
Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Decora. See Macbeth-Evans Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Bros. Glass Co., Wellsburg W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Fort Pitt-Jeannette Glass Co., Jeannette, Pa.
Geneo. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletieco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Karffeld Illuminating Co., Star City, W. Va.
King-Tutankhamen. See Macbeth-Evans Glass Co.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
MacBeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
Marbe. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Mellilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons. Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Pairpoint Corp., New Bedford, Mass.
Pastelle. See Consolidated Lamp & Glass Co.
Persian. See Gillinder & Sons, Inc.
Phene. See Phoenix Glass Co.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasco. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.

Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestopal. See Gleason-Tiebout Glass Co.
Quezal Art Glass & Decorating Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks. Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Reiter, G. C., Canton, O.
Waterbury Mfg. Co., Waterbury, Conn.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
ICE CREAM CABINETS. See Refrigerator Cabinets.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.

INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., Garrison Place and French St., Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 2 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec'l Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tiffany Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Riddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 701 W. Washington, Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickox Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Riddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pyroelectric Instrument Co., Easton, Pa.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Simplex. See Leeds & Northrup Co.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Vawter. See Thompson-Levering Co.
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeers, cable esters and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.
Beck Bros., 3640 N. Second, Philadelphia, Pa.
Beede Instrument Co., 136 Liberty, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.
Crit-Point Meters. See Illinois Testing Laboratories.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Appliance Co., 99 Broadway, Paterson, N. J.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
delity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5225 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Hickox Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Co., 857 Boylston, Boston, Mass.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago, Ill.
Jaynes, R. P., Lynn, Mass.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn N. Y.
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pin-Jack. See Weston Elec'l Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Elsemann Shortfinder Co.
Standee. See Sticht Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Superkeen Company, Salisbury, N. C.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Trinlex Meters. See Roller-Smith Co.
3 In 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Welford, Jr., Geo. W., 5415 Thomas Ave., Philadelphia, Pa.
Weinberg & Co., 870 Blue Island Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)

Beads. See Beads Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Porcelain. See Porcelain.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS

Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS

Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy

Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Macallen & Foundry, Boston, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass

For Composition Jars. See Molded Insulation; also Rubber.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Rodefer Glass Co., Bellaire, O.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook, N. H.
Fisher & Vinal Jewel Wks., Waltham, Mass.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Wennstrem's Sons Co., John, Sufforn, N. Y.
Werley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

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Macalien Co., Macallen & Foundry, Boston, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White & Co., O. C., 17 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.

LACQUER, ARMATURE. See Paint, Varnish and Lacquer, Metal. See Paint, Varnish and Lacquer.

LAMINATIONS. See Discs, Armature.

LAMP BASES. See Bases Reading Lamp.

LAMP BULBS (Unfinished). See Bulbs, Glass.

LAMP FILAMENTS. See Filaments, Incandescent Lamp.

LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.

LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES
(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Waldenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill

LAVA. See Cores, Resistance Coil.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.

LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES
Sign Letter, Flashlight, Projector and Reflector
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Clinton Sign Co., Clinton, Ia.
Consolidated Lamp & Glass Co., Coraopolis, Pa. (Flashlight)
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Delmatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Lights Co., 30 W. 15th, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)

LETTERS, Sign
Glass. Metal.
Adsign Corp, 113 W. 63rd. New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 654 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs Inc., 2736 Wentworth Ave., Chicago, Ill.
McClain, Inc., Wm. H., 1445 S. State, Chicago, Ill.
Onalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)
Steere & Sons, George, 432 S. Dearborn, Chicago, Ill.

LIFTS, Armature
Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.

LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

LOUD SPEAKERS
Manufacturers Units for Portable & Built-in Types.
Air-Chrome. See Temple, Inc.
Aristocrat Corp. of America, 125 W. 23rd. New York, N. Y.
Associated Radio Corp., Ann Arbor, Mich.
Balsa Wood Reproducer Corp., 331 Madison Ave., New York.
Baritone Mfg. Co., 844 W. Jackson Blvd., Chicago. (Unit.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Double Duty. See Aristocrat Corp. of America.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Empire United Hat Block Co., 312 E. 22nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 55½ Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.
Firth Radio Co., 25 Beaver, New York, N. Y.

G. R. P. See Penn Mfg. Co.
Hardsocg Mfg. Co., Ottumwa, Iowa.
Lata Balsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Midwest Radio Specialty Corp., 1519 S. Wabash Ave., Chicago, Ill. (Units.)
Minuet. See Thompson Radio Co.
Molded Wood Products. 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radiocelve. See Fergus Co.
Newcombe-Hawley, Inc., St. Charles, Ill.
Newton Pressed Steel & Mfg. Co., Newton, Mass.
O'Neil Mfg. Co., West New York, N. J.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Platter Cabinet Co., North Vernon, Ind.
Powertone Elec. Co., 222 Fulton, New York, N. Y. (Kit.)
Puropower. See Platter Cabinet Co.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Radiolux. See Amplicon Corp. of America.
Rallotive Corp., 21st Ave. and 53rd, Brooklyn, N. Y.
Radiotone. See Reichmann Co.
Red Lion Cabinet Co., Red Lion, Pa.
Reichmann Co., 1725 W. 74th, Chicago, Ill.
Signal Elec. Mfg. Co., Menominee, Mich.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swcboda Co., Maritime Bldg., Seattle, Wash.
Teletone Corp. of America, Third St. & Van Alst Ave., Long Island City, N. Y.
Temple, Inc., 1925 S. Western Ave., Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
Thorola. See Reichmann Co.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Vitalitone Radio Corp., 203 6th Ave., New York, N. Y.
Voceloud Units. See Firth Radio Co.
Windsor Furniture Co., 1422 Carroll Ave., Chicago, Ill.
Woolf, J. W. & W. L., 227 Fulton, New York, N. Y.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper
French Mfg. Co., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

KEY
Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... P
Arrow Electric Co., 1421 State, Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... P
General Electric Co., Schenectady, N. Y..... S P
Glow Lite. See Royale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman Mfg. Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Luminite Corp., 24 Scott, Newark, N. J..... S P
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C P
Reynolds Spring Co., Jackson, Mich..... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y..... C S P

MACHINE SCREWS. See Screws, Machine.

MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES
Armature Banding. See Banding Machines, Armature.
Armature Notching. See Notching Machines, Armature.
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines Lamp Making.
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.

Mica & Copper CUTTERS

Uniform quality. *Precision* milled, not stamped. *Fast, clean* cutting, *long* life. All sizes. Write for particulars—mention sizes used.

THE BULLHORST MICRO TOOL CO.
3242F Monroe St. Toledo, O.

Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making
For Making Incandescent Lamps and Vacuum Tubes.
Arrow Mach. Co., 527 Hackensack Plank Rd., Union City, N. J.
Barrenberg, R., 12 Farnham (Roxbury), Boston, Mass. (Vacuum Pumps.)
Dwyer Machine Co., East Lynn, Mass.
Elsler Engineering Co., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 39 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines.

MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.

MAGNET CHARGERS. See Chargers, Magnet.

MAGNET STEEL. See Steel, Magnet.

MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.

MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.

MAGNETIC CHUCKS. See Chucks, Magnetic.

MAGNETIC CLUTCHES. See Clutches, Magnetic.

MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent
Bullens Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chicago.
Rogers Drop Forging Co., 42 Frank, Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Stiebel & Co., H. H., 13 Park Row, New

MANGANESE, Battery. See Chemicals, Battery.

MEASURING INSTRUMENTS. See Instruments.

MEGOHMMETERS. See Instruments, Laboratory Standard.

MERCURY SWITCHES. See Switches, Mercury.

METAL CLEANERS (Compound). See Cleaners, Metal.

METAL CUTTING OUTFITS. See Welding and Cutting Outfits.

METAL MARKING OUTFITS. See Engraving Machines.

METALLIC SHADES. See Shades, Metallic.

METERS. See Instruments.

MICA SHADES. See Shades, Mica.

MICA TAPE. See Tape, Mica.

MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA
Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Dielectric Mfg. Co., St. Louis, Mo.
Fillion, S. O., 68 Murray, New York, N. Y.
Fleig Corp., 325 W. Ohio, Chicago, Ill.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 14 Lispenard, New York, N. Y.
Hirsch Mica Co 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Macallen and Foundry, Boston, Mass.
Micabond. See Chicago Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 154 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Minerals & Insulation Co., 101 Spring, New York, N. Y.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals Co., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K. 804 Monadnock Blk., Chicago.
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

MIXERS, INSULATION. See Insulation Mixers.

MOLDED
Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.

MOLDED INSULATION
Alco. See American Insulator Corp.
Alden Mfg. Co., 52 Willow, Springfield, Mass.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., 52 Vanderbilt Ave., New York, N. Y. (Hot and Cold.)
Amerine. See American Insulator Corp.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.

14 Good Reasons

why Leading Electrical Manufacturers

Specify .. MICABOND THE STANDARD MICA INSULATION Insulation

The data given below is the result of careful tests run on standard MICABOND by wholly disinterested laboratories.

Test No.		No. 104 Amber MICABOND Sample .025 Thick	No. 102 India MICABOND Sample .025 Thick
1	Splittings	1" x 1" Area	1" x 1" Area
2	Dielectric Strength in volts per mil	1,181	973
3	Surface Resistivity, Megohm ins. x 10^6	Greater than 30	Greater than 30
4	Volume Resistivity, Megohm ins. x 10^6	Greater than 290	Greater than 300
5	Power Factor, percent	3.2	5.6
6	Dielectric Constant	3.7	5.8
7	Slipping at 500° F.	None	None
8	Compression at 500° F. percent	.9	1.3
9	Density (Sp. Gr.)	2.54	2.53
10	Transverse Strength, lbs.	7.3	10.6
11	Carbonization	Slight	Slight
12	Corrosion, Resin on Copper	None	None
13	Effect of heat, 200° F.	None	None
14	Bond Content, percent	4.8	4.9

The above data shows, beyond doubt, that MICABOND more than meets all of the exacting requirements of the electrical industry. For more than twenty-nine years MICABOND has been the Standard Mica Insulation and today, with the most advanced manufacturing methods, MICABOND has established a reputation for dependability and uniformity that has no equal.

MICABOND is furnisheed in moulding, segment and heater plate as well as tubes, tape, segments, V rings, washers, discs and moulded or punched parts to specification. Specify MICABOND on your blue prints—submit your insulation requirements for MICABOND prices.

CHICAGO MICA CO.

345 Campbell Street
VALPARAISO, IND.

SALES OFFICES IN PRINCIPAL CITIES

BAKELITE MOULDERS

SHAW

FOUNDED 1892

Insulator Company

IRVINGTON, NEWARK, NEW JERSEY

Molded Insulation—Continued
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Compo Products Corp., 222 Passaic, Passaic, N. J.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee,
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimco. See Dayton Insulating Moulding Co.
Durex. See General Plastics, Inc.
Durite. See Stokes & Smith Co.
Electrose. See Insulation Mfg. Co.
Erinold Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Federal Insulating Corp., Yonkers, N. Y.
Fedrelin. See Federal Insulating Corp.
Fenoline. See Insuline Corp. of America.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 16 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Hemmit. See Garfield Mfg. Co.
Hercules Powder Co., Wilmington, Delaware.
Hi-Heet. See Insulation Mfg. Co.
Himconite. See Hopewell Insulating & Mfg. Co.
Hi-Tensit. See Boonton Rubber Mfg. Co.
Hopewell Insulation & Mfg. Co., Hopewell, Va.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Imsreco. See Insulation Products Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., 504 Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Isolantite Co. of America, Inc., Bellville, N. J.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Keystone Specialty Co. (Lakewood) Cleveland, O.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Lavamix. See Splitdorf Radio Corp.
Macallan Co., Macallan and Foundry Sts., Boston, Mass.
Mack Molding Co., Little Falls, N. Y.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
New England Products Co., 232 Greenwich, New York, N. Y.
National Lead Co., 111 Broadway, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Renite. See Nixon Nitration Works.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Elec. & Mfg. Co., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.

The Chandler Co.

Name Plates

Springfield Mass.

Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Splitdorf Radio Corp., Newark, N. J.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synamix. See Garfield Mfg. Co.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOLYBDENUM

Elkon Wks. (subsidiary of P. R. Mallory Co.), Portchester, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire & Contact Co., 255 Sherman Ave., Newark, N. J.

MONEL METAL

International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

MOTORS

Alternating Current ..... See S
Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U

Ace. See A. C. Dayton Co.
A. C. Dayton Co., 308 E. 1st, Dayton, O..... F S ..
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland M .. .. ..
Actodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
American Brown Boveri Elec. Corp., 165 Broadway, New York, N. Y..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
A. R. S. See Westinghouse Elec.
Baldor Elec. Co., 4362 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago..... F S U
Bogue Elec. Co., Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F .. ..
Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 812 Lafayette, Toledo, O..... .. F .. ..
Cah. See Westinghouse Elec. Mfg. Co.
Century Elec. Co., 1806 Pine, St. Louis, Mo.. .. F S ..
Chandeysson Elec. Co., St. Louis, Mo..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Cleveland Elec. Motor Co., 5213 Windsor Ave., Cleveland, O..... M F S ..
Colonial Fan & Motor Co., Warren, O..... M F S U
Continental Elec. Co., 149 Church, New York.... M F S ..
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind. ....
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord, N. H..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O..... .. F S ..
Diehl Mfg. Co., Elizabeth, N. J..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O. .... S U
Dumore. See Wisconsin Elec. Co.
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ....
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J..... M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo..... M F S U
Engbergs Elec. & Mechl. Works, St. Joseph, Mich. ..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., Chicago, Ill..... M .. .. ..
Fidelity Elec. Co., Lancaster, Pa..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn..... .. F .. ..
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., Dept. A, 3314 S. Broadway, St. Louis, Mo..... .. F .. S ..
General Elec. Co., Schenectady, N. Y..... M F S U
Gilbert Co., A. C., New Haven, Conn..... .. F .. U
Globe Elec. Co., 6340 Stoney Island Ave., Chicago M F S ..
Hamilton Beach Mfg. Co., Racine, Wis..... .. F S U
Hertner Elec. Co., 1905 W. 114th, Cleveland, O. M .. S ..
Hobart Bros. Co., Troy, O..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F S ..
Howell Elec. Motors Co., Howell, Mich..... M .. S ..
Ideal Elec. & Mfg. Co., Mansfield, O..... M .. S ..
Imperial Electric Co., Akron, O..... M .. S ..
Janette Mfg. Co., 556 W. Monroe, Chicago..... .. F S ..
Jantz & Leist Elec. Co., Cincinnati, O..... M F .. ..
Jeannin Electric Co., Toledo, O..... M F S ..
Kan-Dor Elec. Co., 1821 E. 59th, Los Angeles M .. .. ..
Kendrick & Davis Co., Lebanon, N. H..... .. F S ..
Kimble Elec. Co., 634 N. Western Ave., Chicago M F S U
King Elec. Co., 35 Murray, New York..... M .. .. ..
Knapp Elec. Corp., Portchester, N. Y..... .. F S U
Leland Elec. Co., Dayton, O..... .. F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Manafield, O..... M .. .. ..
Mando Co., Syracuse, N. Y..... .. F .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marle-Detroit Elec. Co., Gladstone, Mich. ..... M F .. ..
Master Electric Co., Linden and Master Aves., Dayton, O. ..... M F S ..
MC. See General Electric Co.
Metergram. See Bodine Elec. Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
Northwestern Elec. Co., 408 S. Hoyne Ave., Chicago, Ill. ..... M .. S ..
Northwestern Mfg. Co., 440 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio .... F S ..
O K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Pan. See Chandeysson Elec. Co.

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Pow-R-Full. See Wagner Elec. Corp.
Ra-Lite. See Acme Elec. & Mfg. Co.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. ..... M .. S ..
Reynolds Electric Co., 2632 W. Congress, Chicago .. F S ..
Robbins & Myers Co., Springfield, O..... M F S U
Rochester Elec. Products Corp., Rochester, N. Y. M .. S ..
Rotator. See Bodine Elec. Co.
Roth Bros & Co., Chicago, Ill..... M F S ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y. ..... M F S U
Sturtevant Co., Boston, Mass..... M F S U
Sunlight Electrical Mfg. Co., Warren, O..... .. F S ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Triumph Elec. Corp., Carthage, O..... M .. S ..
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Usemco. See U. S. Elec Mfg. Co.
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Mo. M F S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., Cincinnati, O..... M .. S ..
Wisconsin Elec. Co., 59 16th, Racine, Wis.... .. F .. U
Woods Mach. Co., S. A., Boston..... M F S ..
W-P Corp., 530 Marine Trust Bldg., Buffalo... .. F S ..
Zobell Elec. Motor Co., Garwood, N. J..... M .. S ..

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Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Chandler Co., Springfield, Mass.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
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OSCILLOSCOPES. See Instruments, Laboratory Standard.

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Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas. See Thermo Elec. Instrument Co.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Oven Equipment Co., New Haven, Conn. (Coil Driers.)
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Sargent & Co., E. H., Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
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Standard Elec. Stove Co., Toledo, Ohio.
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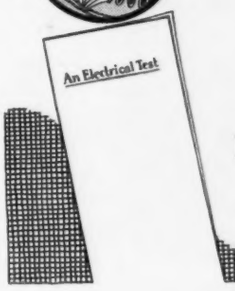

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Lacquer, Metal Finishing .....See L
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Acme Wire Co., Dept. K, New Haven, Conn.... V
Acmewire. See Acme Wire Co.
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. V
American Lastite Co., 3166 Lincoln Ave., Chicago... P L
Antakwa Co., 1329 Mohawk, Chicago, Ill..... P
Apexior. See Dampney Co. of America.
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. ... L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-O-Craft. See Southwestern Paint & Varnish Co.
Atom Chemical Co., 78 E. 10th, New York, N. Y.. ... L
Bakelite Corp., 247 Park Ave., New York, N. Y.... L
Belden Mfg. Co., 2310B, S. Western Ave., Chicago
Benolite Co., 501 Columbia Bank Bldg., Pittsburgh. V P
Berry Bros., Levi & Wight, Detroit, Mich..... V
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V
Bradley-Hurtz Co., 2626 S. Dearborn, Chicago, Ill. ... L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P
Carboloid Products Corp., Hastings-on-Hudson, N.Y. V P
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 438 Danforth Ave., Jersey City, N. J. ..... V P
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeins, Columbus, O. V
Comulac. See Martindale Elec. Co.
Dampney Co. of America, Boston, Mass..... V
Dielectric Mfg. Co., St. Louis, Mo..... V P
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del... P
Eastman Kodak Co., Rochester, N. Y. L
Eclipse Paint & Mfg. Co., Cleveland, O..... P
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York... L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O..... L
Federal Insulating Corp., Yonkers, N. Y..... V P
Flex-ib-lac. See Dielectric Mfg. Co.
Franch & Co., 430 Orleans, Chicago, Ill..... L
General Elec. Co., Mda. Dept. Bridgeport, Conn.. V P
George Co., P. D., St. Louis, Mo..... V
G. E. See General Elec. Co.
Glidden Co., Cleveland, O..... V P L
H. B. See Mass & Waldstein Co.
Hercules Powder Co., Wilmington, Del..... V
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
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Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P
Lucote. See Lucas & Co., John.
Maas & Waldstein, 45 John, New York, N. Y... L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. V
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. L
O'Brien Varnish Co., South Bend, Ind..... V P L
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... P
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
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Pedigree. See George Co., P. D.
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett Schaeffer Chemical Co., Taber, Pittsburgh. P L
Republic Varnish Co., 200 Thomas, Newark, N. J. V
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P
Rockbestine. See Rockbestos Products Corp.
Rockbestos Products Corp., New Haven, Conn.
Ruberoid Co., 95 Madison Ave., New York, N. Y.. P
S. P. C. See Ruberoid Co.
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Sherwin-Williams Co., Cleveland, O..... V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 6th and Broadway, Kansas City, Mo. ..... V P
Standard Flexible Comp. Co., 3607 Haverford Ave., Philadelphia, Pa. ..... V P
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P
Standard Varnish Wks., 423 4th Ave., New York. V P L
Sterling Varnish Co., Fulton Bldg., Hayesville, Pa. V
Toch Bros., 443 4th Ave., New York..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. V
2098. See Mitchell-Rand Mfg. Co.
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P
Vulcan-Lastite. See American Lastite Co.
Walker Co., Henry V., 17 John St., New York.... L
Walpole. See Robertson Chemical Co.
Waukegan Chemical Co., Waukegan, Ill..... L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P
Zapon Co., Stamford, Conn..... L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. ... L

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Connecticut Dynamo Motor Co., Irvington, N. J.
Compro. See Eager Elec. Co.
Eager Electric Co., Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Speciality Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Elec. & Mfg. Co., Mansfield, O.
Jantz & Leist Elec. Co., Cincinnati, O.
Kendrick & Davis Co., Lebanon, N. H.
L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave., Chicago Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
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PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment
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Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
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Dreadnaught. See Cutler-Hammer Mfg. Co.
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Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Esler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
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Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Gripall. See Beaver Machine & Tool Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electric Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Hyman & Co., H., 222 W. 14th, New York.
Imperial. See Consolidated Gas Iron Co.
Iona Co., Los Angeles, Cal.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Jiffy. See Esler Elec. Mfg. Co.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Rodale Mfg. Co., 200 Hudson, New York.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Fowelton Ave., Philadelphia, Pa.
Snapit. See Marks Products Co.
Snoce. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 252 Lafayette, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Stern Elec. Co., 96 Prince, New York.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
U. E. Electric Co., 311 Chambers, Trenton, N. J.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Ward & Co., Robt. J., 247 S. 13th, Philadelphia, Pa. (Metal Tassell Plug.)
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.
POCKET METERS. See Instruments, Pocket.
POINTS, Contact
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)

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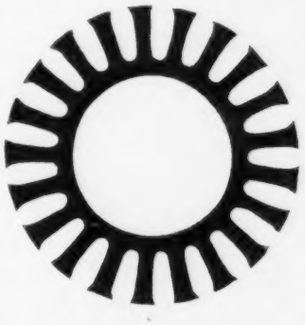

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Interstate Products Corp., 23 Commercial, Newark, N. J. (Platinum and Silver.)
King Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 39 W. 60th, New York. (Platinum.)
Niehoff & Co., C. F., 145 W. Ohio, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes

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A. P. See Akron Porcelain Co.
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Carey Ohio Porcelain Co., Carey, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blue. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard Porcelain Co. Leetonia, O.
Standard & Specialty Porcelain Co., Sun Prairie, Wis.
Star Porcelain Co., Muirhead St., Trenton, N. J.
Summit Porcelain Co., Summit, N. J.
Thomas & Sons Co., R., East Liverpool, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

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Unglazed earthenware cups for primary (wet) batteries.
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Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding

Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Edah. See Mohawk Corp. of Ill.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Hoosick Falls Radio & Electric Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman Co.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PREPAYMENT METERS. See Instruments, Integrating.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil

Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation

Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Elmes Engrg. Works, Chas. F., 222 N. Morgan, Chicago, Ill.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill.
Farquhar Co., A. B., York Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 396 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding

Baird, Andrew, 2715 Newark, Detroit, Mich.

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Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 354 West 13th St., New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft

Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition

Rockwood Mfg. Co., Indianapolis, Ind.
Spruceolite Co., Bloomfield, N. J.

PUMPS, Oil Burner

Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum

To Exhaust Incandescent Lamps.
Arrow Machine Co., 527 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Bishop & Babcock Mfg. Co., 49th & Hamilton Sts., Cleveland.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.
Worthington Pump & Machry. Corp., 115 Broadway, New York.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Niagara Mach. & Tool Wks., Buffalo, N. Y.

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(With Tension Device Attached).
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Browning. See Mutual Foundry & Machine Co.
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Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
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Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Elec. Co., 524 Westminster, Providence, R. I.
Alden Mfg. Co., Springfield, Mass.
All-American Radio Corp., 4233 Belmont Ave., Chicago, Ill.
All-Henry Coil Co., South Gate, Cal.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Alltone. See Miller, Inc., Bertrand F.
Ambassador Sales Co., 108 Greenwich, New York, N. Y.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Amsco Products, Inc., 416 Broome, New York. (TRF Kit.)
Anylite Electric Co., Fort Wayne, Ind.
Arbee Mfg. Co., 68 Springfield Ave., Newark, N. J.
Armo Radio Laboratories, 1666 Tarleton, Los Angeles, Cal.
Arctic. See Premier Elec. Co.
Auburn Button Works, Auburn, N. Y.
Audioformer Transformer. See Pacent Electric Co.
Audiohm. See Electrad, Inc.
Audiovox. See Pacent Electric Co.
Baldwin-Pacific Co., 640 Natoma, San Francisco.
B-Conomizer. See Pilot Elec. Mfg. Co.
Bee-Cee. See Brown & Cain.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bigve-Tuner. See Vogan, Frank C.
Birnbach Radio Co., 254 W. 34th, New York, N. Y.
Bodine Elec. Co., 2254 Ohio, Chicago, Ill.
Bonine. See Turn-It Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Brown & Cain, 2317 Calumet Ave., Chicago, Ill.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Bruno-Radio Corp., 40 Payntar Ave., Long Island City, N. Y.

Buckingham Radio Corp., 25 E. Austin Ave., Chicago, Ill.
Buffer. See Aerovox Wireless Corp.
Buffalo. See DeJur Products Co.
Bypaciton Condenser. See Kapaciton Co.
Camfield Radio Mfg. Co., 807 Harrison, Oakland, Cal.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Carco. See Carter Mfg. Co.
Caldwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Cole Radio Mfg. Corp., 535 Bloomfield Ave., Bloomfield, N.J.
Concertone. See Chicago-Jefferson Fuse.
Concourse Elec. Co., 286 E. 13ith, New York, N. Y.
Condenser Corp. of America, 25 Waverly Pl., New York.
Connectoralds. See Alden Mfg. Co.
Consolidated Instrument Co. of America, 41 E. 42d, New York, N. Y.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crofoot. See Premier Elec. Co.
Cycloid. See Duotone Radio Corp.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
Davidson Radio Corp., 134 Livingston, Brooklyn, N. Y.
Davohm. See Daven Corp.
DeForest Radio Co., Jersey City, N. J.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Duoformer. See Camfield Radio Mfg. Co.
Duopack. See Pacent Elec. Co.
Duratran. See Dubilier Condenser Corp.
Duray Radio Corp., 31 Clinton St., Newark, N. J.
Duotone Radio Corp., Wilmington, Del.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Eagle Mfg. Co., 72 York, Jersey City, N. J.
Eastern Elec. & Mfg. Co., Providence, R. I.
Eastern Specialty Co., 3551 N. 5th, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon Wks., Subsidiary of P. R. Mallory & Co., Portchester, N. Y.
El Menco. See Electro Motive Engineering Co.
Emcotran. See Eagle Mfg. Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsion Radio Corp., 222 Grand, Brooklyn, N. Y.
F-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Farapak. See Globe Art Mfg. Co
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Feri Radio Mfg. Co., 1167 Bedford Ave., Brooklyn, N. Y.
Fett & Kimmel Co., Bufton, O.
Filatrol. See Amsco Products, Inc.
Filtrola. See All-American Radio Corp.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Freesburg Co., George A., Elgin, Ill.
Frost, Inc., Herbert H., Elkhart, Ind.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globe Art Mfg. Co., 67 Winthrop, Newark, N. J.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Co.
Goodwin Radio Corp., 205 Wooster, New York, N. Y.
Goyer Co., Willimantic, Conn.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Grid-Denser. See Amplex Instrument Co.
Gresser Sons Co., B., Sudbury, Boston, Mass.
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hammarlund-Roberts, 1182 Broadway, New York. (Kit.)
Hargraves, C. E. & H. T., Lakewood, R. I.
Harkness Radio Corp., Kenneth, 727 Frelinghuysen Ave., Newark, N. J. (Reflex Kits.)
Harmonik. See Karas Elec. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Henry-Lyford. See University Radio Mfg. Corp.
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Hi-Ohm. See Carter Radio Co.
Hi-Pet. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Held-Tite. See Carter Radio Co.
Hole-in-One. See Ambassador Sales Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Imlag. See Lynch, Arthur H.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co. 2¼ S. 20th, Philadelphia, Pa.
Isodon. See Auburn Button Works.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Kapaciton Co., 26 Elliott Place, Jersey City, N. J.
Karas Elec. Co., 4043C N. Rockwell, Chicago, Ill. (Kits)
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Kilograd. See Pilot Elec. Mfg. Co.
King Cole. See Anylite Electric Co.
Krohlack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
La Peer Elec. Mfg. Co., 326 W. Madison, Chicago. Ill.
Lavite. See Aerovox Wireles Corp.
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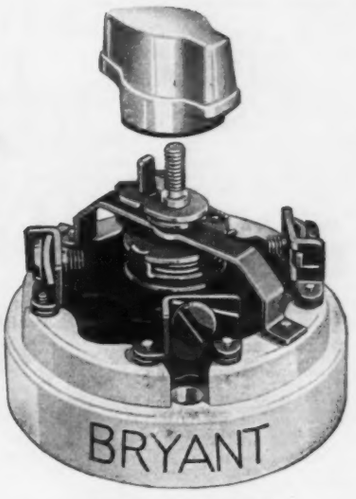

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No. 6279
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"New Wrinkle" Sockets
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are of interest to manufacturers of electric ranges, water heaters, table stoves, etc., and to the builders of motor driven machinery requiring positive motor control.

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.... a single pole, series parallel three-heat-and-off switch of reversible action. Built to the rigid Bryant standards, it will give positive heat control over a long period of service and resistance to possible over loads. No. 6279 is of standard Bryant design though special types are provided to meet unusual needs.

EXPULSION TYPE SURFACE SWITCH
No. 782

.... this new switch was designed especially for inductive loads in 3-phase motor control up to 2-h. p.

An unusually well made switch of great strength and positive action. Two covers are available -- pressed steel or cast iron - each dust proof.

In factories, textile and flour mills, this switch will prove its super-qualities.

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Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lo Wave. See Baldwin-Pacific Co.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Madison-Moore Radio Corp., 2524 Federal Blvd., Denver, Colo.
Marie Laboratories, 512 Main, East Orange, N. J.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Mester Radio Instrument Co., 153 Wright, Newark, N. J.
Maxitran. See Electrical Research Laboratories.
Mazda Radio Mfg. Co., 3405 Perkins Ave., Cleveland, O.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
McCorkle Ensign Co., Elmira, N. Y.
Meggit. See Cole Mfg. Corp.
Megestat. See Pacent Elec. Co.
Melco-Supreme. See Amsco Products, Inc.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metalcak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., Flushing & Porter Aves., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Micro-Coupler Coil. See Simplex Radio Devices, Inc.
Micrograd. See Pilot Elec. Mfg. Co.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Miller, Inc., B. F., High and Canal, Trenton, N. J.
Millimeter Machine Works, Inc., 542 W. 22nd, New York.
Modern Electric Mfg. Co., Toledo, O.
Morris Register Co., Council Bluffs, Iowa.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
National Radio Co., St. Paul, Minn.
Neislide Condenser. See Nelson Tool Co.
Nelson Tool Co., 781 E. 142nd, New York, N. Y.
Neutro-Grad. See Pilot Elec. Mfg. Co.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohmite Mfg. Co., 210 W. Ontario, Chicago, Ill. (Resistance).
One Spot. See Madison-Moore Radio Corp.
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See Amsco Products, Inc.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Panatrol. See Wireless Radio Corp.
Parkin Mfg. Co., San Rafael, Calif.
Peerless Radio Products Co., 10844 Ashbury Rd., Cleveland, O.
Pence & Son, H. O., San Luis Obispo, Cal.
Pennsylvania Radio Laboratories, 37th & Brandywine, Philadelphia, Pa.
Perry Wire Works, 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Piander. See DeJur Products Co.
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfg. Co., Waukegan, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohms. See International Resistance Co.
Powrad, Inc., 486 Johnson Ave., Brooklyn, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Precision Coil Co., 209 Centre, New York, N. Y.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Protectoraid. See Alden Mfg. Co.
Proudfest. See Cruver Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radio File. See Pacent Elec. Co.
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Products Co., Westport, Conn.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Radio Corp.
Receptrad. See Radio Receptor Co.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Elec. Mfg. Co.
R. G. S. Sales Co., 54 Greenleaf Ave., West Brighton, N. Y. (Kit.)
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Rosenbloom Co., Wm., 11 Doering Rd. (Mattapan), Boston, Mass. (Super-Heterodyne Kits.)
R. U. F. Products Co., 319 Glenmore Ave., Brooklyn, N. Y.
St. James Laboratories, 845 Washington Blvd., Chicago, Ill
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Sangamo Elec. Companies, Springfield, Ill.
Scanlan Elec. Mfg. Co., 1113 N. Franklin, Chicago, Ill. (Output Transformers.)
Schetlb & Sons, J. F., 6243 Station, Pittsburgh, Pa.
Scott Sales Co., 443 S. San Pedro, Los Angeles, Cal.
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Radio Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 538 Fernwood Ave., Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
Simplex Radio Co., Main & Rector Sts., Philadelphia, Pa.
Simplex Radio Devices, Inc., 231 Mulberry, Newark, N. J.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Sonatron Tube Co., Chicago, Ill. (Resistance Coupled Amplifier).
Spencer Mfg. Co., Aurora, Neb.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stokes & Smith, (Summerdale) Philadelphia, Pa.
Strand Elecl. Apparatus, Malden, Mass.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.

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Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Thorola. See Reichman Co.
Tobe Deutschman Co., Cambridge, Mass.
Tone Control. See Sprague Specialties Co.
Toreid. See All American Radio Co.
Torostyle. See Bremer-Tully Mfg. Co.
Transcontinental Coil & Winding Co., 5 Kirk Place, Newark, N. J.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tun-A-Far Coil. See Waage Elec. Co.
Tune Rite. See Radiall Co.
Turn-It Radio Sales, 71 Murray, New York, N. Y.
Tuway. See Carter Radio Corp.
Twin-aud. See Peerless Radio Co.
Twin Coupler Co., Poughkeepsie, N. Y.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp. 143 W. Austin Ave., Chicago, Ill.
Ultimax. See Pacent Elec. Co.
Ultra Varlo. See Bruno Radio Corp.
Uncle Sam Electric Corp., Plainfield, N. J.
Univernier Condenser. See Auburn Button Works.
Universal Winding Co., Boston, Mass.
University Radio Mfg. Co., 50 Park Place, New York, N. Y.
U. S. Tool Co., Ampere, N. J.
Variall Condenser. See Muter Co.
Veeko. See Carter Mfg. Co.
Veby Radio Co., 311 S. 11th, Newark, N. J.
Verni-Juster. See Brooklyn Metal Stamping Corp.
Victory. See Carter Mfg. Co.
Viking Tool & Machine Co. 745 65th, Brooklyn, N. Y.
Vogan, Frank C., 1213 Race, Philadelphia, Pa.
Waage, A. H., 112 Chambers, New York, N. Y.
Walbert Mfg. Co., 1000 Fullerton Ave., Chicago, Ill.
Waterbury Button Co. Waterbury, Conn.
Web. See Bathgate Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windham. See Goyer Co., Willimantic, Conn.
Wirco Kit. See Rosenbloom Co., Wm.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.
Wizard Condenser Co., Jamaica Plain, Boston, Mass.
Workrite. See Zinke Co.
X-L Radio Laboratories, 2424 Lincoln Ave., Chicago, Ill.
Yorktown Radio Corp., 122 Cypress Ave., New York, N. Y.
Zinke Co., 1323 Michigan Ave., Chicago, Ill.

RADIO HARDWARE. See Radio Mountings.

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Special cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Alden Mfg. Co., Springfield, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
American Wireless Corp., 33 W. 17th St., New York, N. Y.
Arcturus Radio Co., 255 Sherman Ave., Newark, N. J. (Adapters.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 34th St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Carter Radio Co., 200 S. Racine Ave., Chicago, Ill. (Adapters.)
Connectoraids. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa (Adapters).
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., Elkhart, Ind. (Adapters).
Gossard Radio & Wire Co., Belvidere, Ill.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Morse Co., Frank W., Boston, Mass.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Rigg. See Birnbach Radio Co.
R. U. F. Products Co., 319 Glenmore Ave., Brooklyn, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Electric Mfg. Co., 52 Orawaupum St., White Plains, N. Y.

RADIO MOLDED PARTS

Panels, Dials, Knobs, Tube Bases, etc., of Hard Rubber, Composition, Fibre, Glass and other non-metallics. For Metal Panels and Dials see Radio Mountings.

Accuratune Panel. See Mydar Radio Co.
Ace. See American Hard Rubber Co.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
American Lava Corp., 24 William, Chattanooga, Tenn.
Aristocrat. See Furz-Kasch Co.
Auburn Button Works, Auburn, N. Y.
Bell Mfg. Co., 11 Elkins, Boston, Mass.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Celasta Rubber Co., 68 South, Boston, Mass.

Celoron. See Diamond State Fibre Co.
Century Radio Panel Co., 26 Barclay, New York, N. Y
Dialler. See Loughman, W. F.
Dialog. See Elebeth Co.
Diamond State Fibre Co., Bridgeport, Pa.
Du Pont de Nemours & Co., Wilmington, Del.
Elsler Engrg. Co., 770 S. 13th, Newark, N. J. (Bases)
E-Z-Toon Radio Co., Fortville, Ind.
Federal Insulating Corp., Yonkers, N. Y.
Forest City Rubber Co., 1276 Ontario, Cleveland, Ohio.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati,
Gilligan Glass Products Co.. New Philadelphia, O. (Bases.)
Goodrich Rubber Co., B. F., Akron, Ohio.
Hi-Heet. See Insulation Mfg. Co.
Hood Rubber Co., Watertown, Mass.
Hoosick Falls Radio & Elec. Parts Mfg. Co., Hoosick Falls, N. Y.
Hub Radio Panel Co., 434 Harrison Ave., Boston. (Panels.)
Insulate. See Insulation Mfg. Co.
Insulation Mfg. Co., New York Ave. & Herkimer St., Brooklyn, N. Y.
International Insulating Corp., Elyria, Ohio.
Karolith Corp., 189-13th St., Long Island City, N. Y. (Panels).
Kurz-Kasch Co., Dayton, Ohio.
Lignole Corp., 508 S. Dearborn, Chicago, Ill. (Panels.)
Looksee. See Loughman, W. F.
Loughman, W. F., 161 High, Boston, Mass. (Dials.)
Mahoganite. See American Hard Rubber Co.
Micarta Fabricators, Inc., 309 Canal, New York. (Panels.)
Micarta Panel. See Westinghouse Elec. & Mfg. Co.
New England Products Co., 232 Greenwich, New York, N. Y.
New York Hard Rubber Turning Co., 212 Centre, New York.
Pyradiolin Panel. See Du Pont de Nemours & Co.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., (Irvington) Newark, N. J.
Spaulding Fibre Co., Tonawanda, N. Y. (Panels.)
United States Rubber Co., 1790 Broadway, New York, N. Y.
Veri-Chromed. See Formica Insulation Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.
Waterbury Button Co., Waterbury, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.

Airex Co., 799 Greenwich, New York, N. Y.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Springfield, Mass.
American Radio Hardware Co., 135 Grand, New York.
Asterloid Mfg. Co., Inc., 416 Marcy Ave., Brooklyn, N. Y.
Bonza. See Haydon & Haydon.
Brarston Co., Inc., Chas. A., 297 Washington, Buffalo.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill. (Metal Panels.)
Crystalstat Detector. See Star Crystal Co.
Dejur Products Co., 191 Lafayette, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Etchart Panel. See Grammes & Sons.
Eureka. See Morse Co., Frank W.
Firth Radio Co., 25 Beaver, New York, N. Y.
Glodial. See Wireless Radio Corp.
Grammes & Sons, L. F., Allentown, Pa. (Metal Panels.)
Gray & Danielson Co., Remler Div., 260 First, San Francisco.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa.
Kelbrackets. See Kelleradio, Inc.
Kelleradio, Inc., 821 Market, San Francisco, Cal.
Lynch, Arthur H., Fisk Bldg., B'way and 57th, New York.
Micamould Radio Corp., Flushing & Porter Aves., Brooklyn.
Monosmith Bros. Co., Spencer, Ohio. (Metal Dials.)
Morse Co., Frank W., 289 Congress, Boston, Mass.
Mucher, John J., 109 Lafayette, New York, N. Y.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Palmer & Palmer, 404 W. Utica, Buffalo, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Remler. See Gray & Danielson Co.
Sakura Mfg. & Sales Co., 48 Beekman, New York, N. Y.
Schwartz & Son, Maurice, 710 Broadway, Schenectady, N. Y. (Detectors.)
Star Crystal Co., 525 Woodward Ave., Detroit, Mich.
United Radio Mfg. Corp., 191 Greenwich, New York.
Van Doorn Co., 160 N. LaSalle, Chicago, Ill. (Metal Panels.)
Vee Dee. See Van Doorn Co.
Visco Dial. See Monosmith Bros. Co.
Willis Smith & Inst. Co., 8 Kingsbury, Jamestown, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acast. See United Radio Corp.
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
American Mechanical Laboratories, Inc., 285 N. Sixth, Brooklyn, N. Y.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Aurora Electric Co., 14 Dunham Pl., Brooklyn, N. Y.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
Autostat. See Kodel Radio Corp.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third Newark, N. J. (Multiple Plugs).
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Bruno Radio Corp., 40 Paynter Ave., Long Island City.
Cabelug. See Jones, Howard B.
Caldwell-Knox Co., Galesburg, Ill.
Carter Radio Co., 200 S. Racine Ave., Chicago, Ill. (Also Socket Adapters.)
Champion. See Automotive Equipment Co.
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Clarostat. See American Mechanical Laboratories.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
Dejur Products Co., 191 Lafayette, New York, N. Y.
De Veau. See Stanley & Patterson.
Duostat. See Amsco Products Co.
E-Z. See Polymet Mfg. Corp.
Duray Radio Corp., 31 Clinton St., Newark, N. J.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Forest City Rubber Co., 1276 Ontario, Cleveland, Ohio.

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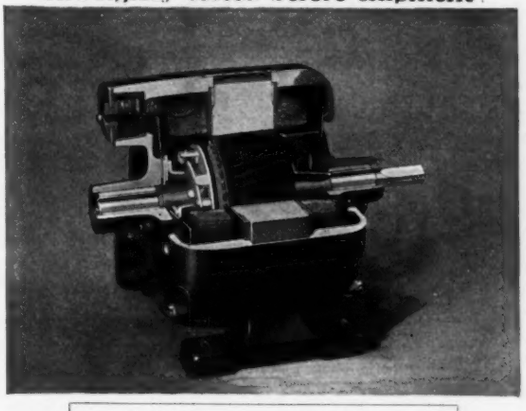

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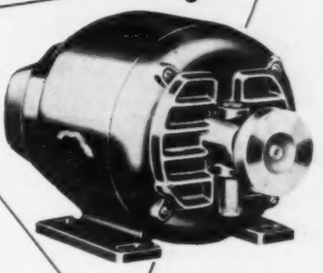

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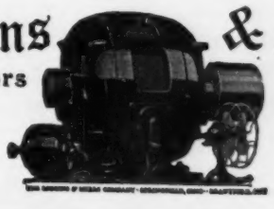

Radio Receiver Parts—Continued
Four Way Co., Springfield, Mass.
Frost, Herbert H., Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2226 Wabansia, Chicago, (Multiple Plug.)
Klesner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Mazda Radio Mfg. Co., 3405 Perkins Ave., Cleveland, O.
Millimeter Machine Works, 542 W. 22nd St., New York.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 289 Congress, Boston, Mass.
Murdock Co., Wm. J., Chelsea, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Engineering Co., 16 Union Ave., New Rochelle, N. Y.
Royalty. See Electrad, Inc.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tip Top. See Eby Mfg. Co.
Tubestat. See Muter Co.
Union Radio Corp., 124 Sussex Ave., Newark, N. J.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
United Radio Mfg. Corp., 191 Greenwich, New York, N. Y.
Urmco. See United Radio Mfg. Corp.
Westerland Corp., Dobbs Ferry, N. Y.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Elec. & Mfg. Co., 351 Halsey, Newark, N. J.
Cable Supply Co., 31 Union Square, New York, N. Y.
C. E. Mfg. Co., 702 Eddy, Providence, R. I.
Cleartron Vacuum Tube Co., 28 W. 44th, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
Daven Radio Corp., 158 Summit Ave., Newark, N. J.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Gold Seal Electrical Co., 250 Park Ave., New York, N. Y.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Northern Mfg. Co., 365 Ogden, Newark, N. J.
Perryman Electric Co., 33 W. 60th, New York, N. Y.
Q R S Music Co., 306 S. Wabash Ave., Chicago, Ill.
Radio Corp. of America, 233 Broadway, New York.
Raytheon Mfg. Co., Kendall Square Bldg., Cambridge, Mass.
Schickerling Products Corp., 401 Mulberry, Newark, N. J.
Sonatron Tube Co., Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.
Van Horne Co., 206 Center, S. Franklin, Ohio.

RADIO TRANSFORMERS. See Radio Circuit Components.
RADIO TUBE BASES. See Radio Molded Parts.
RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

RADIUM POWDER AND PAINT

Radium Dial Co., Forbes and Meyran Ave., Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 30 Church, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Composition.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

	KEY
Battery Charging	See B
Floor Boxes	See F
Welding	See W
Machine Tool	See W
Watertight, Marine, Mine	See M
Car Trailer Connection	See C
Extension	See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O.. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Armeasen Electric Co., 13 Water, New York M
Arrow Elec. Co., Hartford, Conn.... F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill. F W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse, N. Y. B W
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. F
Delta-Star Elec. Co., 2433 Fulton, Chicago W M
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. B
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4232 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
Fullman. See Steel City Elec. Co.
Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
General Elec. Co., Bridgeport, Conn. B
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M E

Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Loeffelholz & Co., Milwaukee, Wis. C
NePage McKenny Co., Armour Bldg., Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ohio Elec. & Controller Co., 5904 Maurice Ave., Cleveland, Ohio. W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Prosef. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 553 W. Monroe St., Chicago, Ill. (Combination wall bracket and convenience outlet.)
Ralco Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M E
Square D. Co., 6060 Rivard Ave., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa.. F E
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. M E
Walker Bros., 1417 Sansom, Philadelphia F E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.

RECORDERS, Elapsed Time. See Indicators, Operation.
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

ABolite Reflector Co., 7500 Sherman Ave., Cleveland, O.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Cello, Inc., 19 W. Houston, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbelite Products Co., 140 N. Robey, Chicago, Ill.
Maxolite See Ralco Mfg. Co.
Monk, H. E., 18 Warren, New York, N. Y.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 553 W. Monroe, Chicago, Ill.
Ralco Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska. Refrigerator Co., Muskegon, Mich.
Allen Filter Co., 25 S. St. Clair, Toledo, O. (Water Cooler Unit.)
American Refrigerator Corp., Peru, Ind.
Anderson Shoe Case Mfg. Co., 321 N. E. Filmore, Minneapolis, Minn.
Argus Products Co., 174 E. Water, Portland, Ore.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Automatic. See Illinois Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Boyer Refrigerator Co., 2217 Locust, St. Louis, Mo.
Cameo Refrigerator Corp., 673 N. Main, Los Angeles, Cal.
Castle Double-Servis. See Home Products Corp.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 131 E. 34th, New York, N. Y.
Cold Storage Refrigerator Co., Eau Claire, Wis.
Coldark. See Commercial Auto Body Co.
Commercial Auto Body Co., 5401 N. Bulwer Ave., St. Louis,
Crystal Refrigerator Co., Fremont, Neb.
Crystleel. See Benjamin Elec. Mfg. Co.
Dillingham Mfg. Co., Sheboygan, Wis.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Crystal Refrigerator Co., Fremont, Neb.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gruendler Mfg. Co., Gustav J., 814 N. Broadway, St. Louis.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 133 W. Washington. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1803 River, Waterloo, Iowa.
Hibbard Co., Euclid Ave. at 65th, Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Home Products Corp., Jackson, Mich.
Howe Scale Co., Rutland, Vt.
Iceless Cooler Corp., 225 N. Michigan Ave., Chicago, Ill. (Ice Cream Cabinets.)
Illinois Refrigerator Co., Morrison, Ill.
J-T Mfg. Co., 666 Lake Shore Drive, Chicago, Ill.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Hershey Bldg., Pittsburgh, Pa.
Knox. See Erie Art Metal Co.
La Crosse Refrigerator Corp., La Crosse, Wis.
Leonard Refrigerator Co., Div. of Electric Refrigerator Co., (Grand Rapids, Mich.
Ligonier Refrigerator Co., Ligonier, Ind.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Lorraine. See La Crosse Refrigerator Corp.

Louisville Refrigerator Co., 660 Shore Drive, Chicago, Ill.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2664 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Northey Mfg. Co., Waterloo, Iowa.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha.
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Polarzon. See Commercial Auto Body Co.
Ranney Refrigerator Co., Greenville, Mich.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Revolvo. See Iceless Cooler Corp.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Saco-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 1731 S. Clark, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

RELAYS

(See also Circuit Breakers and Thermostats.)
Dunn, J. Struthers, 1133 Race, Philadelphia, Pa.
Dunco. See Dunn, J. Struthers.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Wilcolator Co., 17 Nevada, Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE
Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.
RHEOSTATS.
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

F B D P M L
Allen-Bradley Co., 493 Clinton, Milwaukee L
Biddle, James G., 1211 Arch, Philadelphia L
Boice, W. B. & J. E., 1730 Norwood Ave., Toledo, O. L
Brach Mfg. Co., Newark, N. J. (Radio Battery Control.) B
Bradleystat. See Allen-Bradley Co.
Carter Mfg. Co., 6300 Euclid Bldg., Cleveland, O. F
Controlite. See Ward Leonard Elec. Co.
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill. P
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. F B D L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. F
Electric Controller & Mfg. Co., 79th and Woodland Ave., S. Cleveland, O.... F
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. B
General Electric Co., Schenectady, N. Y. F
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. D
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. D M
Knoeller Elec. Co., De Pere, Wis. F
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago F B D M L
Robertson, Leo F., 536 W. 22nd, New York, N. Y. M
Schaefer Bros. Co., 1059 W. 11th, Chicago B
Simplicity. See Cutler-Hammer Mfg. Co.
Unlon Elec. Mfg. Co., Milwaukee, Wis. F
Universal. See Ward Leonard Elec. Co.
Valley Electric Co., 4515 Shaw Ave., St. Louis, Mo. B
Victoreen. See Carter Mfg. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., Mt. Vernon, N. Y. F D M
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F M

RINGS Seal. See Packing.

RIVETS

Chicago Rivet & Specialty Co., 1830 S. 54th St., Chicago, Ill.
Hassall, Inc., John, Clay & Oakland Sts., Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Murhead, near Dewey, Trenton, N. J.

Is Your Equipment Adaptable to ANY Electrical Circuit?

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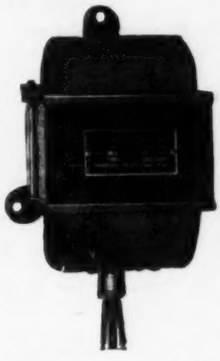

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provide a practical, economical and convenient means of changing the characteristics of odd or objectionable alternating current circuits to better fit your equipment.

They are compact, all self-contained in a single unit—readily portable or can be permanently installed.

Made in sizes ½ to 50 K.V.A., inclusive. Single Phase, Two Phase and Three Phase.

Having no oil, they can be used inside of buildings and Meet all Code requirements.

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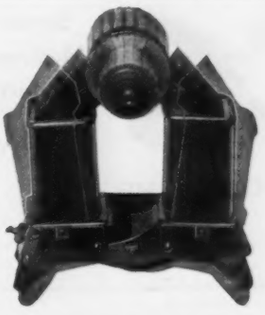
SORGEL ELECTRIC COMPANY
89 W. Water Street Milwaukee, Wis.

IDEAL adjustable and portable Growler



—a tool that will test any armature from ¾″ to 10″ in diameter.

"IDEAL" Growlers make the proper span, eliminating the troublesome core or slot shorts. Can be used with any standard meter lamp test; or, as a magnet charger when used with batteries. Will cling to large armatures.

"IDEAL" Growlers are wound for 60 cycle, other frequencies at slight additional cost. Windings are armoured to protect from mechanical injury. Complete with 6 foot cord, switch and plug.

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Electric Motor Control Apparatus

ALL TYPES OF D.C. MOTORS

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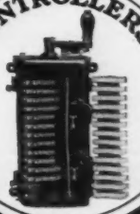

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Standard-Special Explosion Proof For all Purposes A.C-D.C.

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UP TO 2¼ in. DIAMETER

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RUBBER, Hard—Continued
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco. See Vulcanized Rubber Co.

RUBBER, Sponge

Toycraft Rubber Co., Ashland, O.

RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines.

SCRAPERS, Wire

Acme. See A. Laubscher.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW MACHINE PRODUCTS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
Chapman Machine Co., Terryville, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Faries Mfg. Co., Decatur, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis, Ind.
Linden & Co., 891 Broad, Providence, R. I.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Machine

Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlisle & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ernest Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Ferry Mfg. Co., St. Louis, Mo.
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 585 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.

Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 555 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 306 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Artistic Lamp Shade Co., 848 Milwaukee Ave., Chicago.
Art Lamp Shade Studios, New York, N. Y.
Audrey Art Shade Studios, 105 Thatchford Ave., Brooklyn.
Block & Co., L. D., 57 E. 18th, New York. (Silk, Linen.)
Borghese. See Hall, Chas.
Caldwell & Co., E. F., 36 W. 15th, New York, N. Y.
Cohan Co., Laigh M., 205 S. Ninth, Philadelphia, Pa. (Silk.)
Cowen Corp., B. W., 53 W. 23rd, New York. (Silk.)
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Drescher & Werthelmer, 32 E. 30th, New York. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Fess Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Fess Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Geber Co., J. B., 43 W. 17th, New York, N. Y. (Silk.)
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Guthman Solomons & Co., 150 Broadway, New York. (Silk.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Hygrade Lamp Shade Co., 121 Wadsworth, New York, N. Y.
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kelton Mfg. Co., Worcester, Mass. (Silk.)
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Liberty Lamp Shade Co., 139 Fifth Ave., New York, N. Y.
Luxrite. See John H. St. John.
Majestic Lamp Shade Co., 30 Irving Pl., New York, N. Y. (Large Silk.)
Max-Ray. See Maxwell Ray Co.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Miller Co, Meriden, Conn. (Silk, Parchment.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
New York Lamp Shade Co., 131 W. 19th, New York. (Silk.)
Noe & Sons, Wm. R., New York, N. Y. (Silks)
Parchment Novelty Co., 37 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Franklin Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Royal Lamp Shade Co., 38 W. 21st, New York. (Silk, Cretonne.)
Ryan, Mary, 225 5th Ave., New York, N. Y. (Chintz and Parchment.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
San Dor. See Ryan, Mary
Savoy Mfg. Co., 115 E. 24th, New York. (Silk-Parchment.)
Schlanger Co., F. E., 34 W. 17th, New York, N. Y.
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Storrs Mica Co., 11 Park Place, New York, N. Y.
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Sun Glo Lamp Shade Co., 54 W. 21st, New York, N. Y. (Parchment and Fabric.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.
Warner Shade & Novelty Co., 18 W. 18th, New York. (Silk.)
Ye Neighborhood Studio, 144 MacDougal, New York, N. Y. (Parchment.)

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 223 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 101 Park Ave., New York, N. Y.
Bent Glass Novelty Co., 54 W. Third, New York, N. Y.
Handel Co., Meriden, Conn.
Mosaic Shade Co., 589 E. Illinois, Chicago, Ill.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Novelty Lighting Corp., 2488 E. 22nd, Cleveland, O.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia.
Tiffany Studios, 391 Madison Ave., New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)

PORTLAND-MONSON SLATE CO.

PORTLAND-MONSON SLATE CO. TRADE MARK PORTLAND, ME.

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Monson Slate for Electrical Purposes, Natural Black, Oil Finish

Quarries: Monson, Maine

Office, Portland, Maine

Frink Co., Inc., 230 10th Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 111 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 76 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 809 S. Main, Waterbury, Conn. (Miniature.)
Waterbury Mfg. Co., Waterbury, Conn.

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

For Switchboard Slabs and Barriers.
Davis Slate Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burke Controller Co., 389 Lexington Ave., New York, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hulhorst Micro Tool Co., 3242 E. Monroe, Toledo, Ohio.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 34 Royalston Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 57 Warren, New York, N. Y.
Westinghouse Elec & Mfg. Co., East Pittsburgh, Pa.

SOCKET LININGS. See Linings, Socket
SOCKETS, Flashing. See Flashers, Sign.

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Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.

Abbott. See Harvey Hubbell, Inc.
American Brass Co., Waterbury, Conn. (Acorns)
Arrow Electric Co., Hartford, Conn.
Auburn Elec. Co., Butler, Ind.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Harrigan, T. M., Woodstock, Vt. (Links.)
Hart & Hegeman Mfg. Co., Hartford, Conn. Metal Pull Tassel.
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 30 Shipman, Newark, N. J. Links, Insulators.

SOCKET REDUCERS

Arrow Elec. Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Morse Co., Frank W., 289 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 80 Boylston, Boston, Mass.
SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key ..... See K
Composition ..... See W
Metal Shell ..... See B
Porcelain ..... See A
Pull Chain ..... See P
Push Through ..... See T
Sign Receptacles ..... See A

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. ..... M ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Co., Hartford, Conn. ..... M C K T P B A
Arrogrip. See Arrow Elec. Co.
Atlantic Elec. Lamp Co., Salem, Mass. ..... K .. P ....
A. & W. See General Outdoor Adv. Co.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third, Newark, N. J. ..... C .... P B ..
Bence. See Benjamin Elec. Mfg. Co.
Bryant Elec. Co., Bridgeport, Conn. M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M .. K T P B A
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M .. K T .. B A
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T .. B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B ..
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C .....
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Fluteller. See Pass & Seymour.
Frink Co., Inc., 230 10th Ave., New York, N. Y. ..... M C ..... B ..
Gaynor Elec. Co., Bridgeport, Conn. ..... A
General Elec. Co., Bridgeport, Conn. ..... M C K T P B A
General Outdoor Adv. Co., 1028 Carnegie Ave., Cleveland, O. ..... A
Globe Elec. Co., 22 Queens, Long Island City, N. Y. ..... M ..... B ..
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... M C K T P B A
Hoosick Engrg. Co., Hoosick Falls, N. Y. .....
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
Hyman & Co., Henry, 222 W. 14th, New York, N. Y. ..... B ..
H. & H. See Hart & Hegeman.
1-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 225 Newell, Brooklyn, N. Y. ..... M C K .. P B A
Levoller. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Meteor Elec. Corp., 499 E. 70th, New York, N. Y. ..... K .. P ....
Molded Socket Corp., Railroad, Pa. ..... K .....
Multilok. See Circle F Mfg. Co.
New Wrinkle. See Bryant & Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & A. See Parker-Aeolus Corp.
P. & S. See Pass & Seymour.
Parker-Aeolus Corp., J. H., 161 Grand New York, N. Y. ..... A
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Peme. See Pliaduct Elec'l Mfg. Co.
Perkins. See Bryant Elec. Co.
Perke. See Perkins Marine Lamp.

Pliaduct Elec'l Mfg. Corp., 260 Stone Ave., Brooklyn, N. Y. ..... T .....
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Ratner Elec. Mfg. Co., 195 Morgan Ave., Brooklyn, N. Y. ..... M ..... P B ..
Roberts Elec. Mfg. Co., 211 Centre, New York, N. Y. (Candle.) ..... T .. B ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y. .....
Royal. See Sears, Henry D.
Safti See. See Molded Socket Corp.
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Simco. See Hoosick Engrg. Co.
Siemen Co., Bridgeport, Conn. .....
Tapiet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
TEC. See Electric Company.
Union Insul. Co., Parkersburg, W. Va. .....
U. S. Electric Co., 20 Chambers St., Trenton, N. J. ..... A
Walce. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B ..
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P .....
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Cambridge Smelting Co., Cambridge, Mass.
Chicago Solder Co., 4212 Wrightwood Ave., Chicago, Ill.
Dielectric Mfg. Co., St. Louis, Mo.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., Newark, N. J.
Soldux. See Dielectric Mfg. Co.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SOLDERING

LENOIDS. See Coils, Finished.

Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Amco. See American Solder & Flux Co.
Anchor. See Garden City Laboratories.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Blue Seal Chemical Co., 126 Locust, Roselle, N. J.
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brubner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductable. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Firth Radio Co., 25 Beaver, New York. Soldering Fluid.
Eureka. See Grasselli Chemical Co.
Fluxite. See Monarch Products Co.
Garden City Laboratory, 38 S. Dearborn, Chicago, Ill.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Read Mfg. Co.
Killark Elec. Mfg. Co., 3940 Easton Ave., St. Louis, Mo.
Letellier Laboratories, 119 Main St. E., Rochester, N. Y.
Leveridge, Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmont Ave., Philadelphia, Pa.
McGill Mfg. Co. Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neer Co., L. F., Butler, O. (Flux and Solution.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.

Perfecto. See Firth Radio Co.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste. Salts. Sticks, Fluid, Oil, and Solid Sal Ammonica.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., Jersey City, N. J.
Redens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 330 E. 133rd, New York, N. Y.
Ruby Chemical Co., 68 McDowell, Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
S. O. S. See Universal Supply Co.
Salbrick. See American Solder & Flux Co.
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderall Co., Newark, N. J.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Special Chemicals Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co
Superior. See Highland Electro Chemical Co.
Technical Products Co., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Tisit. See Letellier Laboratories.
Universal Laboratories, University, Va. (Flux.)
Universal Supply Co., Fairmont, Minn.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept B, 1217 Washington, Boston.
Adrola Corp., Port Jefferson, N. Y.
Alco Electric Co., 92 Washington, New York, N. Y.
Allatonce Soldering Machine. See Chapman Elec. Wks., P. E.
All-Rite Co., Indianapolis, Ind.
American Beauty. See American Elecl. Heater Co.
Americal Elecl. Heater Co., Detroit, Mich.
Beckwith Machine Co., Ravenna, Ohio.
Betsy Ross. See Central Flatiron Mfg. Co.
Bode. See Baco Electric Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 116 1st Ave. N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., 124 W. 18th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper.)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lucifer. See Jones Point Tool & Elec. Co.
McAdams Co., J. C., Long Island City, N. Y.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., First National Bank Bldg., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Nu-Way. See McAdams Co.
Permway Mfg. Co., St. Charles, Mo.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio See Drake Elec. Wks
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Rhamstine, J. Thomas, 500 E. Woodbridge, Detroit, Mich.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Silva-Wares, Inc., 129 Maiden Lane, New York, N. Y.
Soderwand. See Suttle Equipment Co.
Superior Elec. Products Co., 1300 S. 13th, St. Louis, Mo.
Suttle Equipment Co., Lawrenceville, Ill.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Wolcott Mfg. Co., Frank E.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Wagg Mfg. Co., H. A., Wapello, Iowa. (Storage Battery Type.)
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.
White Beauty Elec. Co., 4416 N. Western Ave., Chicago.
Wolcott Mfg. Co., Frank E., 80 Pliny, Hartford, Conn.

SOLDERING MACHINES, Commutator

(For production soldering of small commutators).

Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SPAGHETTI. See Tubing, Varnished Fabric.
SPEED CHANGING UNITS. See Gears (Speed Changing Units).
SPEED INDICATORS. See Tachometers.
SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYERS, Electric

Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Little Brown Jug, Inc., Reading, Pa.
Sprayit. See Electric Sprayit Co.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES

Sleeper & Hartley, Worcester, Mass.

SPRINGS, Small

American Spring & Mfg. Co., 212 Elm, Detroit, Mich.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Farrington & Co., 28 W. Grand, Mt. Vernon, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.

42,000 air miles

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45,000,000 makes and breaks

WITHOUT RENEWAL

WILSON Platinum-iridium contact points

¶ This truly faultless performance on Colonel Lindbergh's "Spirit of St. Louis" is your assurance that WILSON QUALITY affords a lasting solution of your contact point problem.

¶ Wilson contact points and Wilco thermostatic metal have flawlessly withstood the severest practical working conditions—the result of years of striving toward perfection.

¶ Our broad and varied experience will aid you in obtaining the correct Wilson product for your purpose.

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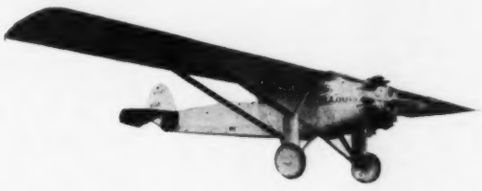

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Platinum-iridium Contact Points
in
Scintilla "Aircraft" Magnetos
on
Wright "Whirlwind" Motor

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Silver contact points
Special alloys
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Refiners and Workers of

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SILVER AND OTHER PRECIOUS METALS—WILCO THERMOSTATIC METAL

97 Chestnut Street, Newark, N. J.

SPRINGS, Small—Continued
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
STAMPED BOXES. See Cabinets, Sheet Steel.
STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third, Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third, Newark, N. J.
Bull Dog Electric Products Co., Detroit, Mich.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Faries Mfg. Co., Decatur, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. O., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 109 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Niagara Metal Stamping Co., Niagara Falls, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1724 N. Fifth, Philadelphia, Pa.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 34 Royalston Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Manelec. See Mansfield Sheet & Tin Plate Co.
Mansfield Sheet & Tin Plate Co., Mansfield, O.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Trumbull Steel Co., Warren, Ohio.
Wheeling Steel Corp., Wheeling, W. Va.

STOCKS, Dies and Reamers

Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., 1836 Euclid Ave., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.
STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.
STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
STRANDING MACHINES. See Wire Manufacturing Machines.
SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARDS, SLABS AND BARRIERS

See Asbestos Slabs; Molded Insulation; Slate; Soapstone.
SWITCH (Switches)
Arms. See Posts, Binding.

"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife. See Switches, Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor;
Mercury. See Switches, Mercury
Motor Starting. Magentic Type. See Controllers.
Motor Starting. Non-Magnetic Type. See Switches, Knife.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Toggle. See Switches, Snap.
Tumbler. See Switcehs, Snap.

SWITCHES, Battery and Baby Knife

Cut-Outs. Switches.
Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crown. See Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handle. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jest. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec. Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago, Ill.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Ranson Electric Co., Canton, Mass.
Spere Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Knife; Safety

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dall Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 3907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mandell Elec. Mfg. Co., Mattanoisett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Super-Safety Switch Co., 1219 W. 103d St., Chicago, Ill.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 144 Bleeker, Newark.
V. Y. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Federal Gauge Co., 564 W. Adams, Chicago, Ill.
Hywatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
M. D. Co. See Mechanical Devices Co.
Mechanical Devices Co., Aurora, Ill.
Mercoid. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer Mfg. Co., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1133 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY
Feed Through ..... See p
Fixture (Canopy, Candelabra and Key Arm) ..... See F
Flush ..... See f
Lever, Toggle, Tumbler ..... See L
Pendant ..... See p
Push Button ..... See P
Rotary ..... See R
Surface ..... See s

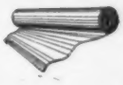
See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo. f . . . . . .
Anylite Elec. Co., Ft. Wayne, Ind. . . . . L . .
Arrow Electric Company, Hartford, Conn. f sp P R L F
Arrow Head. See Arrow Elec. Co.
Beaver Machine & Tool Co., Dept. 10-R, Newark, N. J. . . . . f p P . . . F
Best. See Hyman & Co., Henry.
Brascolite. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. . . . . f . . . . . .
Bridgeport Switch Co., 209 Center, Bridgeport, Conn. . . . . L F
Bryant Elec. Co., Bridgeport, Conn. . f sp P R L . . F
B. S. Co. See Bridgeport Switch Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. . . . . F
Circle F. Mfg. Co., Trenton, N. J. . . . f . . P . . L F
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . p P R L F
Crouse-Hinds Co., Syracuse, N. Y. . . . . L . .
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis. . . . . P . . . . L . .
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal. . . . . R . . . .
Diamond H. See Hart Mfg. Co.
Dugle. See Bryant Elec. Co.
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . F
Gaynor Elec. Co., Bridgeport, Conn. . . . . f . . . . . L . .
General Elec. Co., Bridgeport, Conn. . . . f sp P R L F
G. E. See General Elec. Co.
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman.
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. . . . . F
Hart Mfg. Co., Hartford, Conn. . . . . f sp P R L . .
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.) . . . . . f sp P R L F
Hart. See Hart & Hegeman Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Harvey, Inc., Bridgeport, Conn. . . sp . . . L F
Hyman & Co., Henry, 222 W. 14th, New York, N. Y. . . . . f . . . . . .
Jost. See Morse, Frank W.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y. . . . . f . . P . . . . .
Leviton Mfg. Co., 226 Newell, Brooklyn . . . . . F
Levolier. See McGill Mfg. Co.
L. P See General Elec. Co.
McGill Mfg. Co., Valparaiso, Ind. . . . . f . . . . . L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. . . . . s . . R . . . .
Morse Co., Frank W., 289 Congress, Boston, Mass. . . . . P . . . . . .
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill. . . . . L F
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. . . . . f sp P . . L F
Paulding, John I, New Bedford, Mass. . . . f s P . . . . . .
Pen Tap. See Beaver Mach. & Tool Co.
Perkins. See Bryant Elec. Co.
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y. . . . . L . .
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Roberts Elec. Mfg. Co., 2.3 Centre, New York, N. Y. . . . . F
Rodale Mfg. Co., 200 Hudson, New York p . . . . . .
Sears, Henry D., 80 Boylston, Boston. . f sp P R L F
Sho-Lite, Inc., Dept. R, 141 Merrimac, Boston, Mass. (Pilot Light.) . . . . . f . . . . . .
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. . . . . P . . . . . .
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. . . . . f s P R L . .
Trigle. See Bryant Elec. Co.

62 GUARDIANS
of electrical performance

1. Air Brake Motor Insulation
2. Armatite — Fish Paper and Varnished Cambric Combined
3. Armature Slot Insulation
4. Armature Twine
5. Armco Paper
6. Bushings—Micanite
7. Cable Joint Insulation
8. Commutator Insulation
9. Discs—Raw Mica

10. Duck-Oiled and Varnished
11. Empire Oiled Cloth; Paper
12. Empire Oiled Tubing
13. Fibre—Untreated
14. Filling Compound
15. Fish Paper—Untreated
16. Flexible Micanite
17. Glue
18. Heating Unit Insulation
19. Horn Fibre



20. Kablak; Black Varnished Cloth and Paper
21. Linolac (Amber Varnish)
22. Linotape (Oiled Tape)
23. Micoid Paper—Black
24. M. I. C. Compound (Black Varnish)
25. Moulding Micanite
26. Oiled Tubing
27. Oiled Tape
28. Paper and Mica
29. Paper - Oiled and Varnished
30. Paper—Red Rope

31. Pressboard—Untreated
32. Railway Motor Insulation.
33. Raw Mica—Cut to Pattern
34. Rings for Commutators
35. Rope Paper—Oiled
36. Segments—Micanite
37. Shellac Varnish
38. Silk—Oiled
39. Silk Tape
40. Sleeving—Varnished
41. Sleeving—Cotton
42. Soldering Paste
43. Splicing Compound
44. Stay Binding
45. Surgical Webbing
46. Tape for Armature Coils
47. Tape—Friction
48. Tape—Mica
49. Tape—Rubber
50. Tape — Untreated Cotton Silk
51. Transformer Insulation
52. Tubing—Mica

53. Tubing—Oiled or Varnished
54. Twine—Armature
55. Varnishes
56. Varnished Cloths
57. Washers—Built-Up Mica
58. Washers—Micanite
59. Washers—Raw Mica
60. Webbing
61. X-Ray Terminal Insulation
62. Empire Seamless Bias Tape

DIRECTING electrical traffic —guiding current along its predetermined path of usefulness in electrical equipment of every description—that is the mission of the 62.

Ever since the pioneer days, Mica Insulator Company has kept abreast of the demands for better and better insulation for the generation, transmission and utilization of electrical energy.

"Micanite," the original pasted mica insulation, and "Empire" treated cloth insulations are outstanding examples of the contributions which the Mica Insulator Company has made to the art of electrical insulation. Every one of the 62 products provides a means of assuring better, more dependable electrical equipment.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Cleveland Pittsburgh Cincinnati San Francisco
Los Angeles Seattle Toronto, Canada
Works: Schenectady, N. Y. London, England

PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

Switches, Snap—Continued
Trumbull Elec. Mfg. Co., Plainville, Conn. f s P R L ..
Twi-Lite. See McGill Mfg. Co.
Victor. See Keil & Son, Francis.
Weber. See Sears, Henry D.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y. ..... F
Workrite. See Morse, Frank W.

SWITCHES, Snap; Heavy Duty
Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Penn Electric Machine Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.
Sechrist Mfg. Co., Albert, 1717 Logan, Denver, Colo.

SWITCHES, Tank
Anderson Electrical Works, 212 W. Austin Ave., Chicago, Ill.
Automatic Appliance Co., 226 N. St. Clair, Dayton, Ohio.
Automatic Switch Co., 154 Grand, New York.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Penn Elec. Switch Co., 12th & Walnut Sts., Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilbocken Mfg. Co., 404 Grove, Milwaukee, Wis.

TACHOMETERS
Speed Indicators, Speedometers, Revolution Counters.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.

TAGS, Cable; Pole and Battery
American Radio Hardware Co., 203 Lafayette, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brooklen Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Niagara Metal Stamping Corp., Niagara, N. Y.
Premax. See Niagara Metal Stamping Corp.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping
Campbell Paper Box Co., South Bend, Ind.
TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos
American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville, Inc., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk; Tape, Sleeving, Webbing.
Anchor Weobing Co., Pawtucket, R. I. Cotton, Silk.
Aweleco. See Anchor Webbing Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beledentape. See Belden Mfg. Co.
Eagle. See Sidebotham, Inc., John.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.
Hall & Carey Weaving & Belting Co., Lockport, N. Y.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Guscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica
Chicago Mica Co., Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction
Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Jas., Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Armature-White. See Boston Woven Hose & Rubber Co.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., P. O. Box 5077, Boston Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okenite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Evergrip. See Boston Woven Hose & Rubber Co.
Firestone Tire & Rubber Co., Akron, O.
Fleig Corp., 325 W. Ohio, Chicago, Ill.
General Elec. Co., Merchandise Dept., Bridgeport, Conn.

Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holdfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Hyvolt. See Fleig Co., L. L.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Ireo. See Imperial Rubber Co.
Johns-Manville, Inc., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Lavelle Rubber Co., 320 W. Illinois, Chicago, Ill.
Magnet. See Boston Woven Hose & Rubber Co.
Manson. See Okonite Co.
Mystic. See Lavelle Rubber Co.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Security. See United States Rubber Co.
Service. See Boston Woven Hose & Rubber Co.
Slipknot. See Plymouth Rubber Co.
St. Louis Rubber Cement Co., 3952 West Pine, St. Louis.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holdfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victer. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric
Acme Wire Co., Dept. K, New Haven, Conn.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulator Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.
TAPS. See Stocks, Dies and Reamers.
TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peterfield. See Electric Service Supplies Co.

TERMINALS, Wire
All-in-One. See Ohio Parts Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dixie Supply Co., 91 7th Ave., New York, N. Y.
Fahnestock Elec. Co., cor. East Ave. and Eighth, Long Island City, N. Y.
Firth Radio Co., 25 Beaver, New York, N. Y.
Grammes & Sons., Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Mazda Radio Mfg. Co., 1330 E. 26th, Cleveland, O.
Morse Co., Frank W., 289 Congress, Boston, Mass.
Ohio Parts Co. (Local), Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pines Mfg. Co., 408 N. Sacramento, Chicago, Ill.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. D., Battle Creek, Mich.
Tinkerbox. See Weber Elec. Wks.
Waterbury Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.

TEST BENCHES, Armature
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Mfg. Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 N. Capitol, Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weldenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.
TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil
(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weldenhoff, Joseph.
Allen-Bradley Company, 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co.
B. W. Elec. Co., 719 S. Sarah, St. Louis, Mo.
Century Electrical Co., 100 Randall Ave., Syracuse, N. Y.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weldenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weldenhoff, Joseph.
Electric Controller & Mfg. Co., 70th St. & Woodlawn Ave., Cleveland, Ohio.
Electric Machine Corp., 529 N. Capital, Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.

Ev-Ri-Test. See Weidenhoff, Joseph.
Forest Electric Co., 272 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 477 Broadway, New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kietzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Meco. See Metropolitan Mfg. & Elec. Co.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill.
Metropolitan Mfg. & Elec. Co., 1163 Sedgwick, Chicago, Ill.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., Minneapolis, Minn.
Paneltest. See Forest Electric Co.
Portometer. See Forest Electric Co.
Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Reliance Instrument Co., 1135 Van Buren, Chicago, Ill.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Universal Test Equipment Co., 2939 N. Oakley Ave., Chicago, Ill.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES
Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.
THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL
Briggs & Sons Co., J., Providence, R. I.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

THERMOSTATS
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Thermostat Co., 226 Jeliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 2 Lanesville Ave., Boston, Mass.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Federal Gauge Co., 564 W. Adams, Chicago, Ill.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
King. See Electric Heat Control Co.
Leachwood Co., Janesville, Wis.
Manhattan Elec'l Supply Co., New York, N. Y.
Marvel. See American Thermostat Co.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
Pyratherm. See Federal Gauge Co.
National Steel Construction Co., 425 Frontenac, Seattle.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sensatherm. See Federal Gauge Co.
Standard Thermometer Co., 63 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermosnap. See Spencer Thermostat Co.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Federal Gauge Co.

TIGHTENERS, Commutator
Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.
TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TIPS, Cord
Alden Mfg. Co., 52 Willow, Springfield, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentube. See Belden Mfg. Co.
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
Na-Ald. See Alden Mfg. Co.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S., 415 Sayonton, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Tinsel. See Wire, Bare.
Waterbury Brass Goods Corp., Waterbury, Conn.
TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing
Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Dies and Jigs
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.

TOOLS, Storage Battery
Battery Equipment & Supply Co., 1638 S. Wabash Ave. Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Loads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cowie Elec. Co., Kansas City, Mo. (Jar Lifting Pliers.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Ibsco. See Illinois Battery Steamer Co.
Illinois Battery Steamer Co., Peoria, Ill.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)

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TOOLS, Storage Battery—Continued
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyrotip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES
Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Champion. See Lenk Mfg. Co.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Red Dragon. See Lenk Mfg. Co.
Staysalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Oil Burner.

TRANSFORMERS, Low and Intermediate Voltage
Sorgel Elec. Co., 89 W. Watz, Milwaukee, Wis.

TRANSFORMERS, Oil Burner Ignition
For Oil Burners and Gas Tube Signs.
American Bosch Magneto Corp., Springfield, Mass.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Jefferson Elec. Mfg. Co., 501 S. Green, Chicago, Ill.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.
TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel
Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.
TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Flexible Arms. See Tubing Flexible, Metallic.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Rubber. See Tubing, Rubber.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBING, Brass and Copper
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
British American Tube Co., 233 Broadway, New York.
Bull Dog. See British American Tube Co.
Chase Companies, Inc., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 745 Military Ave., Detroit, Mich.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Metal Hose Mfg. Co., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Leachwood Co., Janesville, Wis. (Seamless Flexible Hose.)
National Metal Molding Co., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.

TUBES, Paper; Cores; Sleeves, Bushings
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Straw Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

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Cochrane Chemical Company
Established 1887
432 Danforth Ave., Jersey City, N. J.

TUBING, Rubber
Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.

TUBING, Varnished Fabric
Insulating Tubing—Spaghetti.
Acme Wire Co., Dept. K, New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Goodrich Rubber Co., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.

UNITS, Rods and Grids, Resistance
Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Electric Heater Co., 1505 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Darie Co., 35 E. 21st, New York, N. Y.
Despatch Oven Co., 120 1st Ave., N., Minnapolis, Minn. (Space Heater and Oven Units.)
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 79th and Woodland Ave. S., Cleveland, O.
Electro Thermal-Unit Co., 21st and Washington Ave., Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Farrington & Co., Inc., 28 W. Grand, Mt. Vernon, N. Y.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
Galvo Elec. Co., 1813 Columbus Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa. (Radio Resistance.)
Ironium Products Co., 112 Hamilton, Cleveland, O.
Krischer's Mfg. Co., Colyer, Diamond and Newell, Brooklyn.
Leuthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
National Elec'l Supply Co., 1328 New York Ave., Washington, D. C.
Neleo. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 214 W. Ontario, Chicago, Ill.
Ohm-Srum. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replacesll. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Simplex Electric Heating Co., 85 Sidney, Cambridge, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waag. Elec. Co. 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Weise Electric Co., 3217 Lisbon Ave., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
White Beauty Elec. Co., 4416 N. Western Ave., Chicago, Ill.

Wiegand Co., Edwin L., 422 1st Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.

VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated
Absolute Con-tac-tor Corp., Elkhart, Ind.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., ft. of Tolman, Boston, Mass. (Water.)
Crane Co., S. Michigan Ave., Chicago, Ill.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
Jenkins. See Automatic Switch Co.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-33rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works, Akron, Ohio.

WASHERS, Leather
Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock
National Lock Washer Co., Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.

WASHERS, Metallic
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.

WATTMETERS. See Instruments.

WAX AND COMPOUNDS
Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.....S
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S
Clifton Mfg. Co., 65 Brookside Ave., Boston.....C
Cochrane Chemical Co., 452 Danforth Ave., Jersey City, N. J. ..... W S
Dielectric Mfg. Co., St. Louis, Mo. ..... W C
Dolph Co., John C., 168 Emmet, Newark, N. J. W
Ever-Protect. See National Cable Compound Co.
General Electric Co., Bridgeport, Conn. ..... W
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. ..... W S
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich. ..... W
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
Insulatine Co., 1 Broadway, New York. ..... W
Lehon Co., 4411 Oakley Ave., Chicago, Ill. ..... W
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co. Valparaiso, Ind. C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W
Nu-Blac. See Star Porcelain Co.
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... W
Rubberseal. See Mitchell-Rand Mfg. Co.
Seldner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. ..... W
Sherwin-Williams Co., Cleveland, O. ..... W C
Standard Varnish Wks., 433 4th Av., New York.. W
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W S
Star Porcelain Co., Trenton, N. J. ..... W C
Tacrite. See Seldner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. ..... W S
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. ..... S
Zinsser & Co., 48 Vesey, New York, N. Y..... W

WELDS, Lamp Lead-In. See Filaments, Incandescent Lamp.

WELDING AND CUTTING OUTFITS
Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme. See Cushing Mfg. Co.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Corp., 726 Washington, Buffalo.
Alternare. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Atlas. See Railway Track Work Co.
Automatic Trolley Guard Co., 65 Carroll, Buffalo, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Ry. Improvement Co., 2070 E. 61st, Cleveland, O

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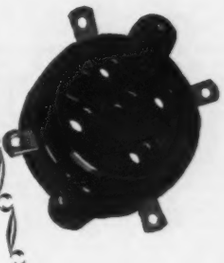

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Erico. See Electric Railway Improvement.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fuzon Welding Corp., 103rd St. & Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 169 5th Ave., New York, N.Y.
Gesco. See General Engineering.
Gibb Welding Machines Co., Bay City, Mich.
Hanson. See Northwestern Mfg. Co.
Indianapolis Switch & Frog Co., Springfield, O.
Lincoln Electric Co., Coit Rd. and Kirby Ave., Cleveland.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Plastic Arc. See Wilson Welder & Metal Co.
Railway Track Work Co., 3132 E. Thompson, Philadelphia.
Rail Welding & Bonding Co., 1615 Collamer Ave., Cleveland.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 1202 Maccabees Bldg., Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Taylor Welder Co., Warren, O.
Taylor-Winfield Corp., 12 Atlantic, Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Thordarson Electric Mfg. Co., 500 W. Huron, Chicago, Ill.
Toledo. See Thompson.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Welding Materials Co., 114 Liberty, New York, N. Y.
Weldrite. See Electric Welding Machine Co.
Wemco. See Welding Materials Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Winfield Elec. Welding Machine Co., 12 Atlantic, Warren, O.
Zeus. See Gibb Welding Machine Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.
Winding Forms. See Forms, Coil Winding.

WINDING FORMS. See Forms, Coil Winding.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Brownlog. See Mutual Foundry & Machine Co.
Chatman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 34 Royalston Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Acme Products Co., 22 Elkins (S. B.), Boston, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electrical Products Mfg. Co., Providence, R. I.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Ridlon Company, Frank, 253 A St., Boston, Mass.
Standard Radio & Elec. Co., Pawtucket, R. I.
Universal Winding Co., Boston, Mass.
Varley Duplex Magnet Co., 136 Seventh, Jersey City, N. J.
Weber & Scher Mfg. Co., 263 Sussex Ave., Newark, N. J.
Webscher. See Weber & Scher Mfg. Co.
Weehawken Elec. & Mfg. Co., 543 Gregory Ave., Weehawken, N. J.

WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

Athey Co., 6142 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord). Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding	See S
Copper Wire	See C
Iron Wire	See S
Phosphor Bronze	See R
Radio Bus Wire	See C
Resistance Wire	See R
Steel Wire	See S

Acme Wire Co., Dept. K, New Haven, Conn.... C ....
Advance. See Driver Harris Wire Co.
Airtram. See Radio-Electric Mfg. Co.
Alloy Metal Wire Co., Moore, Pa..... C R ..
Alpha Radio Supply Co., 520 Broadway, New York C ....
American Brass Co., Waterbury, Conn.
American Copper Products Corp., 233 Broadway, New York, N. Y..... C R ..
American Electrical Works, Philipsdale, R. I.... C ....
American Fabric Co., 45 Baker, Providence, R. I. C ....
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C .. S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill..... C .. S
Anaconda. See American Brass Co.
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y..... C ....
Belden Mfg. Co., 2310B S. Western Ave., Chicago C .. S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass..... .. R ..
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.

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Calido. See Driver Harris Wire Co.
Celatsite. See Acme Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C .. ..
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa..... C .. S
Cornish Wire Co., 30 Church, New York, N. Y.. C .. ..
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C .. ..
Cupron. See Gilby Wire Co.
Daron Mfg. Co., 101 Bradford, Providence, R. I. C .. ..
Detroit Insulated Wire Co., Detroit, Mich..... C .. ..
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J..... .. R ..
Electron. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.. .. ..
Gilby Wire Co., Riverside Ave., Newark, N. J.... R ..
Goldmark Co., James, 83 Warren, New York.. C .. ..
Hope Webbing Co., Providence, R. I. (Braided Wire Tape)..... C .. ..
Hoskins Mfg. Co., Detroit, Mich..... .. R ..
Hudson Wire Co., Ossining, N. Y..... C R ..
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind..... C .. S
Indiana Steel & Wire Co., Muncie, Ind..... .. .. S
Inland Wire & Cable Co., Sycamore, Ill..... C .. ..
Ironium Products Co. 112 Hamilton, Cleveland, O. .. R ..
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C .. ..
Monarch Elec. & Wire Co., 622 W. Adams, Chicago C .. S
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark.. .. R ..
Nehring Electrical Works, De Kalb, Ill..... C .. ..
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn..... .. .. S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I..... C .. ..
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C .. ..
Raco. See Ross Wire Co.
Radio Elec. Mfg. Co., 442 Clinton Ave., Newark, N. J..... C .. ..
Roebling's Sons Co., John A., Trenton, N. J..... C .. S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y..... C .. ..
Ross Wire Co., 69 Bath, Providence, R. I..... C .. ..
Selcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O..... .. .. S
Silchrome. See Alloy Metal Wire Co.
Solar. See Gilby Wire Co.
Sparge Wire Co., J. A., Rome, N. Y..... C .. ..
Standard Alloy Wire Co., Elizabeth, N. J..... .. R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa..... C .. ..
Super-Insulated Wire Co., Plymouth, Mass..... C .. ..
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., 59 Chestnut, Central Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C .. ..

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

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Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 5 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.

WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire	See A
Asbestos Covered Heater Cord	See H
Asbestos Covered Magnet Wire	See M
Enameled Magnet Wire	See M
Fixture Wire	See R
Flexible Reinforced Heavy Duty Cord	See F
Heater Cord	See H
Ignition Cable	See R
Lamp Cord	See R
Magnet Wire	See M
Rubber Covered Wire & Cable	See R
Stove Wire	See H
Telephone Cord	See T

A-A Wire Co., 114 Liberty, New York R .. ..
A-1 Brand. See American Insulated.
Acme Wire Co., Dept. K, New Haven, Conn. Enameled Silk, Cotton..... .. .. M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.

American Brass Co., Waterbury, Conn..... A .. M ..
American Copper Products Corp., 233 Broadway, New York, N. Y..... .. ..
American Electrical Works (Philipsdale), Providence, R. I..... .. .. M
American Enameled Magnet Wire Co., Muskegon, Mich..... .. .. M
American Fabric Co., 45 Baker, Providence, R. I..... R F .. A T ..
American Insulated Wire & Cable Co., 954 W. 21st, Chicago, Ill..... .. .. M
American Insulated Wire Corp., 45 Baker, Providence, R. I..... R F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.
Ansonia Electrical Co., Ansonia, Conn. Silk, Cotton, Enameled..... .. .. .. A .. M
Armorlokt. See American Steel
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), Boston..... R .. ..
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y..... R F .. ..
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass..... R F H .. .. ..
Bradford, Kyle & Co., Plymouth, Mass. .. .. M
Cablex. See Collyer Insulated Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I..... R F H .. .. ..
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R .. ..
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J..... R F H A T M
Daron Mfg. Co., 101 Bradford, Providence, R. I..... R .. ..
Davis-Jones Insulated Wire Co., Pawtucket, R. I..... R F H A T ..
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R .. .. .. T ..
Diamond Braiding Mills, Chicago Heights R F H .. .. ..
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R .. H .. .. ..
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. .. .. M
Durabilt. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Furo. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass..... .. F .. ..
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. .. .. T ..
General Asbestos & Rubber Co., Charleston, S. C..... .. .. .. H .. .. ..
General Elec. Co., Bridgeport, Conn.... R F H .. .. ..
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet..... .. .. A .. M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R .. .. .. T ..
Grimshaw. See New York Ins.
Habirshaw Cable & Wire Corp., 10 E. 43rd, New York, N. Y..... R .. ..
Hatfield Rubber Wks., Inc., Hillside, N. J. R .. H .. .. ..
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa. R F .. A .. .. ..
Hercules Powder Co., Wilmington, Del.. .. .. .. A .. M
Holyoke Co., 621 Broadway, New York.. R .. .. A .. M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind..... R F H .. .. ..
Inland Wire & Cable Co., Sycamore, Ill. R .. H A .. M
Ironite. See Paragon Elec. Co.
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y..... R .. ..
Kilo, Co., 2 E. 23d, New York..... .. .. .. T M
Koelle, Frederic C., Real Estate Trust Bldg., Philadelphia, Pa..... .. .. .. T ..
Liberty. See Nat. Metal Molding.
Lowell Insulated Wire Co., Lowell, Mass. R F H .. .. ..
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass..... R .. .. .. T ..
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled..... .. .. M
Marion Insulated Wire & Rubber Co., Marion, Ind..... R F H A T ..
Massachusetts Elec. Mfg. Co., West Lynn, Mass..... .. .. M
Monarch Elec. & Wire Co., 622 W. Adams, Chicago, Ill..... .. .. .. A .. ..
National India Rubber. See U. S.
National Metal Molding Co., 1135 Fulton Bldg., Pittsburgh, Pa..... R F H A T M
N. E. See Goldmark Co., James.
New England Wire Co., Westfield, Mass.. R .. H .. T ..
New York Insulated Wire Co., 114 Liberty, New York, N. Y..... R .. ..
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co.
Okonite Co., Passaic, N. J..... R .. ..
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F .. ..
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paragon Electric Co., 409 S. Dearborn, Chicago, Ill..... R .. ..
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa..... .. .. H A T ..
Phillips Wire Co., Pawtucket, R. I..... R .. ..
Providence Insulated Wire Co., Providence, R. I..... R F H A .. ..
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Co., New Haven, Conn. R .. H .. .. M

Parts for air-cooled rheostat molded by "AICO" for American Specialty Company.

"AICO"

—it means correct molding

"AICO" is serving, consistently, those electrical manufacturers who have ceased to *experiment* in the solution of their molding problems.

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New York Office—52 Vanderbilt Avenue

Plants at New Freedom, Pa.—Danbury, Conn.

"Cetec"

was the *first* cold molded composition in COLOR

ANTICIPATING the coming demand for color in cold molded insulation, we began long ago to offer "CETEC" to the industry in various colors.

Keeping always a step in advance of the growing use of color, we have increased the variety of colors and combinations, always seeking new applications and improvements.

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We probably have just what you are looking for, —if not, we'll see that you get it.

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WIRE, Insulated—Continued

Roebling's Sons Co., John A., Trenton, N. J.	R	F	H	A	T	M	
Rome Electrical Co., Rome, N. Y.							M
Rome Wire Co., Rome, N. Y.	R	F	H		T	M	
Ross Wire Co., 69 Bath, Providence, R. I.	R						
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill.					T		
Safety Cable Co. (Div. of General Cable Corp.), New York	R	F	H				
Salamander. See York Insulated.							
Sewart Wire Co., Parkersburg, W. Va.	R						
Silkenamel. See Belden Mfg. Co.							
Silkenite. See Acme Wire Co.							
Simcore. See Simplex Wire.							
Simplex. See Simplex Wire.							
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass.	R	F					
Shield. See Ansonia Elec'l Co.							
Spiralweave. See Hazard Ins. Wire Works.							
Standard Alloy Wire Co., Elizabeth, N. J.			H				
Standard Insulated Wire Co., Westfield, Mass.	R		H				
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.)	R	F	H	A	T		
Sterling. See Standard Underground.							
Sterling Insulated Wire Co., Fall River, Mass.	R						
Strand & Sweet Mfg. Co., Winsted, Conn.							M
Super-Insulated Wire Co., Plymouth, Mass.							M
Super-Service. See Rome Wire Co.							
Sweetstrand. See Strand & Sweet.							
Tip-Top. See Standard Underground.							
Tirex. See Simplex Wire & Cable.							
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn	R						
Tubular Woven Fabric Co., Pawtucket, R. I.	R	F					
United States Rubber Co., 1790 Broadway, New York, N. Y.	R		H	A	T		
U. S. Royal. See United States Rubber. Co.							
Varflex Corp., Rome, N. Y.							M
Warrior. See American Copper.							
Wheeler Insulated Wire Co., Bridgeport, Conn.	R	F	H	A	T	M	
White, J. M., 1128 Oliver, Philadelphia, Pa.	R	F	H		T		
Whitney Blake Co. See Graybar Electric Co.							
Wovenite. See Flexible Woven.							
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y.	R		H			M	

WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines ..... See A
Braiding Machines ..... See B
Bunching Machines ..... See S
Covering Machines ..... See I
Insulating Machines ..... See I
Insulation Straining Machines ..... See I
Measuring Machines ..... See M
Park Cabling Machines ..... See A
Saturating Tanks ..... See F
Spooling Machines ..... See U
Stranding Machines ..... See S
Tinning Tanks ..... See F
Winding Reels ..... See U

	I	A	B	M	S	U	F
Adamson Machine Co., Akron, Ohio	I	A					
Aimco-Seward. See American Insulating Machinery Co.							
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.	I	A			S	U	F
Breguet. See American Insulating Machy.							
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis.				M		U	
Crescent. See Royle & Sons, John.							
Housatonic Machine & Tool Co., Bridgeport, Conn.	I					U	
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn.				M		U	
Nebuttco. See New England Butt Co.							
New England Butt Co., 324 Pearl, Providence, R. I.	I	A	B	M	S	U	
Peerless. See Royle & Sons, John.							
Royle & Sons, John, Paterson, N. J.	I						
Sleeper & Hartley, Inc., Worcester, Mass.		A			S	U	F
Terkelson Machine Co., 326 A St., Boston, Mass.				M			
Textile Machine Works, Reading, Pa.			B				
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn.		A				U	F
Wardwell Braiding Machine Co., Central Falls, R. I.			B				
Wire Machinery Corp. of Am., New Haven, Conn.				M	S	U	
Utility Mfg. Co., Cudahy, Wis.	I						
Weir. See Housatonic Machine & Tool Co.							

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.

WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers, Wire Insulation.

WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.

WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

WRINGERS, Clothes

Anchor Brand. See Lovell Mfg. Co.
Arora. See Hart, Wallace B.
Chamberlain Machine Wks., Waterloo, Iowa.
Hart, Wallace B., 8 E. 34th, New York, N. Y.
Hercules. See American Wringer Co.
Lovell Mfg. Co., Erie, Pa.
Nevercrush. See Prima Mfg. Co.
Niagara. See Lovell Mfg. Co.
"1900" Washer Co., Binghamton, N. Y.
Prima Mfg. Co., 1612 Market, Philadelphia, Pa.
Riverside Photo. See Lovell Mfg. Co.
Safetee Wringer. See "1900" Washer Co.
Zenite Metal Co., 201 N. West, Indianapolis, Ind.

YARN AND THREAD; Silk, Cotton, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville, Inc., New York, N. Y. (Asbestos.)
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin Grasselli Chemical Co.
Horse Head. See New Jersey Zinc Co.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co., 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Matthiessen & Hegeler Co., La Salle, Ill.
New Jersey Zinc Co., 160 Front, New York, N. Y.

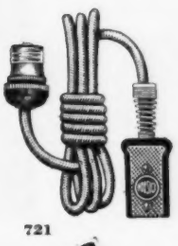
The May issue of

ELECTRICAL RECORD

will have an 18600 distribution among the leading electrical buyers throughout the United States and Canada, the largest distribution in its 36 years.

Make it a 100% appliance

by equipping it with the RIGHT *plug and cord set for—*



721

714

Heaters,
Toasters,
Table Stoves,
Percolators,
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Curling Irons,
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Fans,
Soldering Irons,
Drink Mixers,
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Lamps,

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. . . it is probably true that the average purchaser of an electrical appliance doesn't look twice at the cord or the plug, BUT—he certainly finds out the difference in good and bad accessories after he has used the appliance awhile.

HOOSICK FALLS doesn't produce a cheap product in these cord sets, appliance and attachment plugs yet they're not expensive.

Look at item No. 715—here's an appliance cord set comprising a brown Rayon cord with a gold stripe; a brown appliance and attachment plug.

It's a cord set worthy of the best made appliance.

If you wish quotations and samples—write us.

715

732

720

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739

730

750

738

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Radio & Electrical Parts Manufacturing Company, Inc.

Moulded Parts Of Quality Insulation

Hoosick Falls, N. Y.

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Reduce Costs with

Garfield Molded Compositions

Valuable information may be obtained from

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Established 1908

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Economical
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The best for Electric Heating Appliances

Our clay specialties, plain and threaded tubes, and Refractory Porcelain for Electric Heating Appliances are superior in every way; and "PORCELAVA" makes the best Pyrometer Insulation.

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INSA-LUTE porcelain cement for assembling replaces . . . .

. . . nuts, bolts and screws. INSA-LUTE is a liquid, porcelain cement—it will hold together any material with *permanent* rigidity. Its adhesive powers are far in advance of glue, paste and other insulating material. It is a **perfect fireproof insulation.**

Ideal Covering for Resistor Coils

Our engineering staff is at your service. Tell us what you make that we may supply samples.

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Fireproof contact without solder

Conductalute
Electric Conductive Paste

Conducts electricity without wires. A non-corrosive cold solder. Base for electric resistors. Prevents arcing at contacts.

TECHNICAL PRODUCTS COMPANY
Makers of INSA-LUTE Cement (liquid porcelain)
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PURCHASING officials, also, reduce "chance buying" to a minimum.

Buy special springs from spring specialists. LEE-BUILT springs are as *sure* in your equipment as a bonded employee in your organization. LEE literature covers in complete detail every angle of the spring question. It is important that you have yourself placed on the list to receive "Spring Data,"—regularly issued.

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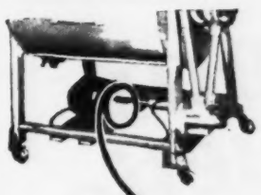

There is a life preserver for washing machines

and this is it!

This amazingly simple device, the ONEIDA flexible coupling, certainly does preserve the life of electric washers, ironers, refrigerators, oil burners, etc., by absorbing vibration, starting shocks and overload. It is really a most effective shock absorber, and is the means of increasing your appliance's life and efficiency. More details? Certainly,—glad to tell you about it.

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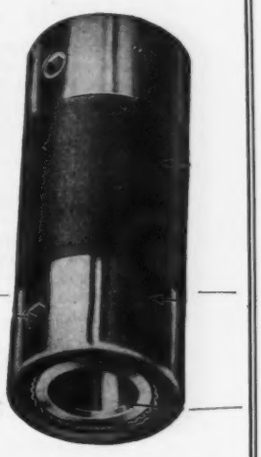
Syracuse, N. Y.



Oneida
FLEXIBLE COUPLING

for every other motor drive, too!

—here's an insulation that offers something *unusual*

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PHENOLIC LAMINATED INSULATION

Campbellite is unusual in every feature. It has exceptional dielectric and mechanical strength; its merits as a phenolic laminated insulation are proven; in its many uses in the electrical industry it has shown an efficiency far above many other materials.

You can get it in any shape; in sheets, rods or tubes; and highly glossy panels for radio and similar uses.

A sample will convince you of Campbellite's quality. Write for yours today.

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mill it—
shape it—
thread it—
drill it—
tap it!

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When you buy insulation remember that Campbellite offers something not in common with other materials.

Yes—you may send us samples of "Campbellite"

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24 hour production in BAKELITE MOULDING from *your* moulds

If you have volume articles, tell us what moulds you have and we will tell you what our 24-hour production will produce daily.

This 24-hour production cuts your mould cost in half on new articles on which a large daily production is required. It also cuts our costs to such an extent you can hardly afford not to have our prices.

We build our own moulds so precision moulding is assured. We can also supply any inserts required. Let us quote you on your volume articles on which you require a certain daily production. We specialize in Bakelite moulding.

Our service costs you nothing. A trial will convince you.

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Metal combined with moulded parts

saves time and money....a service designed for your convenience

MOULDED insulation and metal tooling requires precision, workmanship and skilled mechanics for perfect work.

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That is why we have combined both departments in the same plant.

Excutive supervision from the raw material to the finished product guarantees accuracy—quality—speed and economy.

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FOR all insulation purposes . . . . and wherever acid-proof and moisture-proof material is required.

Furnished in *rod, tube, sheet, and special radio panels* which conform to Bureau of Standards requirements.

Also *special turned and custom moulded parts* to your specifications.

Let us quote on your next requirements

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MOULDING *in Bakelite*

You can depend upon exact uniformity of the highest degree in our BAKELITE products, made from our own moulds — because we make the moulds, too — to any specification.

Let us know your needs so we may send you samples and prices.

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For Electrical Use has a good firm edge where punched or sheared.

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One or a million without variation

THE Sylvania Products Co. of Emporium, Penna., makers of Sylvania radio tubes, now use Durez for their tube bases. They find that this remarkable plastic not only meets their high standards of quality, but—it actually lowers their production costs.

Many other large manufacturers have told us the same thing. Durez eliminates many costly operations. It fuses and hardens with marvelous rapidity. Once molded the part is complete. No tooling or burnishing necessary. And—best of all—the millionth part an exact duplicate of the first.

Durez is most attractive in appearance. Manufacturers can produce better-looking parts and produce them faster and more economically with Durez. With Durez you can give your product better insulating properties, better wearing properties, and an all-round distinction which brings quicker consumer acceptance.

At left are a number of Durez radio parts. For the manufacturer of each of these, Durez is bringing about a manufacturing economy and producing a more durable and acceptable product. Our engineers and laboratories are at your service. Write to us today.

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Our new booklet, "Do it with Durez," tells the complete story of this wonderful plastic. It shows how Durez is economically adapted to meet the most exacting needs. Profusely illustrated in full colors. Write for a copy today.

Our new factory, 32,000 sq. ft. of fireproof space, was designed and constructed, building and kilns, by the Harrop Ceramic Service Company, of Columbus, O., who are specialists in the Ceramic line.

A new name

—because we have moved to Akron, and are concentrating on making Porcelain of Special Design. Quality is our prime endeavor; and our old factory at Mogadore could no longer serve our customers' growing demands.

A new plant

—brick and glass, equipped for straight line production — motor driven — all important machinery *new*. Excellent shipping facilities. Just a greater factory, for greater service—

the same personnel
no combine—no sale

We'd like to quote you on your specifications or drawings—assuring you Special Porcelain of high quality at favorable prices. From now on, write to—

THE AKRON
PORCELAIN CO.
Akron, Ohio

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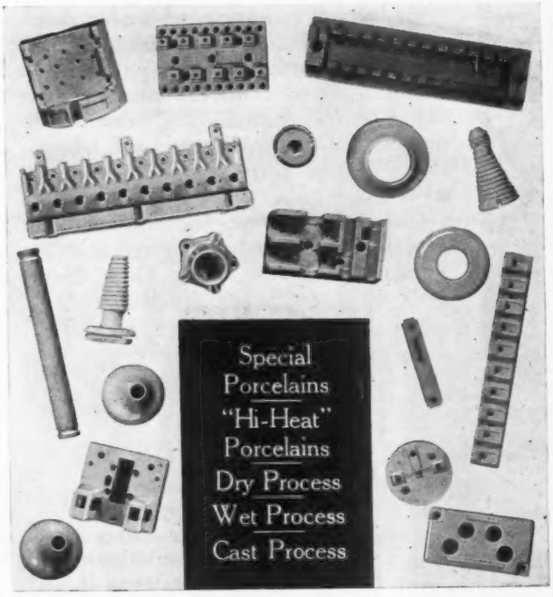

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Established 1894 AKRON, O.

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guiding you straight to porcelain satisfaction

Porcelain buying is not a gamble or a matter of guess work if you specify or insist upon getting STAR Quality. Star Porcelain is real quality and yet the price is as low as some inferior kinds. Let STAR Quality guide you.

The STAR
PORCELAIN COMPANY
TRENTON NEW JERSEY

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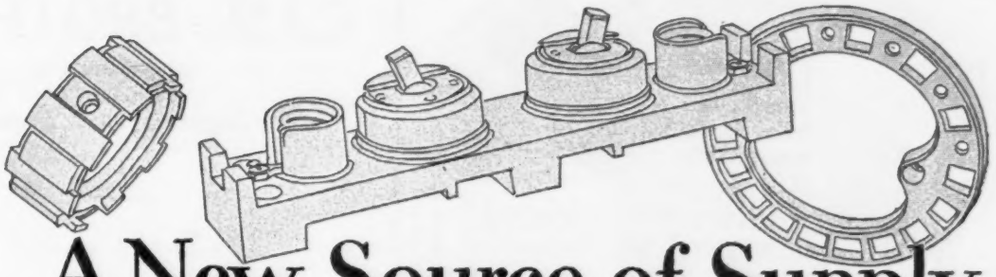

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Textolite Molded is the name to remember whenever you want a permanent and dependable source of supply of custom-molded parts.

Here are shown a few of the large variety of intricate Textolite Molded forms produced through the unlimited resources of General Electric's modern plants.

Purchasing agents are offered, in Textolite Molded, that high quality which is typically G-E.; huge production facilities; a world-wide service; and all the economies resulting from scientific mass production.

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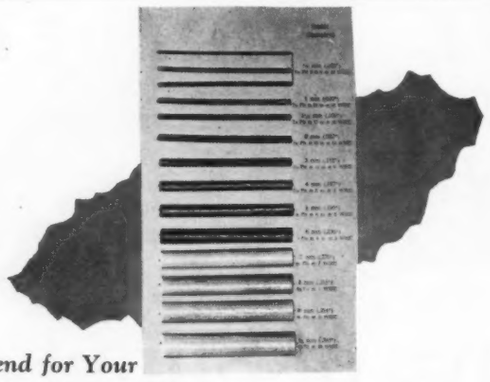

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Turbo Oil Tubing represents all that good tubing should be. It is heavily impregnated inside and outside—constructed to withstand the highest voltage. It is uniform, flexible and durable.

But "seeing is believing," to quote the old saying. So we have prepared a SAMPLE book of TURBO OIL TUBING, showing fourteen different sizes. Each sample piece is adequately large for any test you might want to put it to. Twist, bend or pull it, subject it to high voltage—test it any other way. Its basic goodness will prove a revelation to you. Send for your SAMPLES today.

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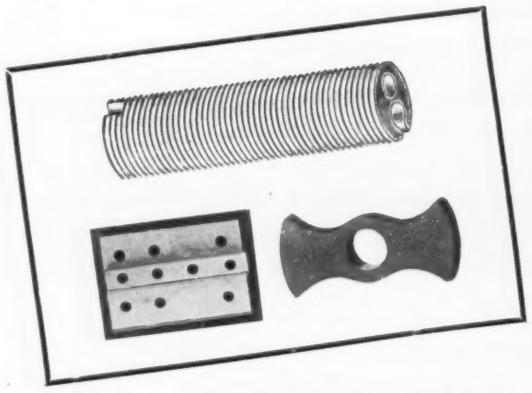

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LAVA INSULATORS are unexcelled in instruments requiring a fixed relation of their parts under all conditions.

Permanent in nature, lava is not subject to variations in structure and composition.

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24-38 William St.
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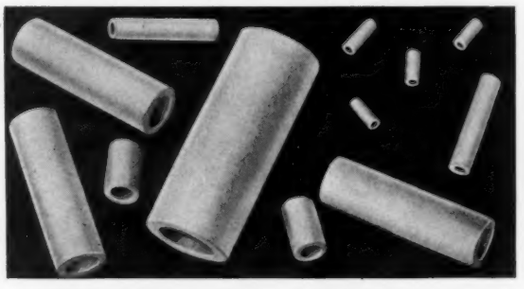
Manufacturers of Heat Resistant Insulators

"You can't afford to experiment!"



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Years of research and experience in the manufacture of electrical refractories enable us to offer a product unexcelled in *density and strength of body* and *ability to withstand thermal shock.*

Tubes and rods for resistance windings, heating element supports—wherever a quality electrical refractory is needed—will be made to your specifications—guaranteed absolutely *straight, clean cut, smooth* and *uniform.*

Send for Samples!

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STANDARDIZE
FOR YOUR
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REQUIREMENTS
ON

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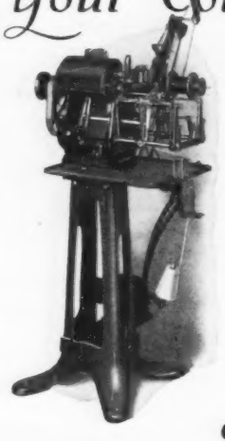

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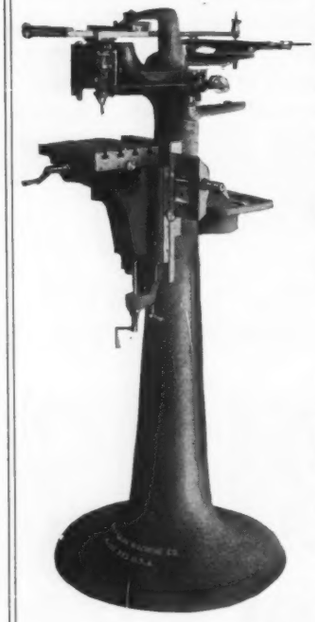

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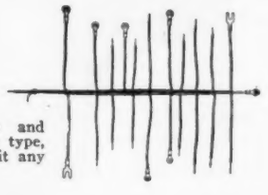

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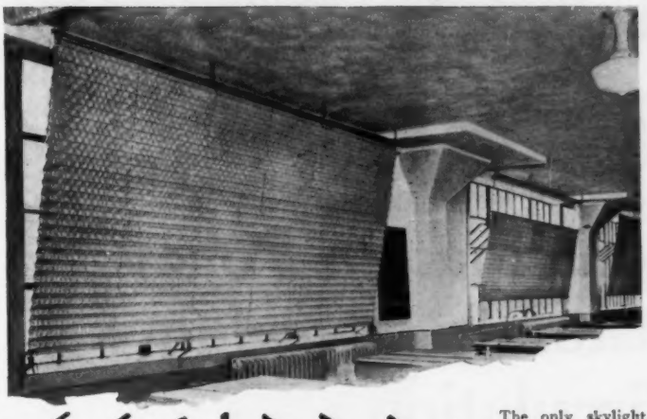

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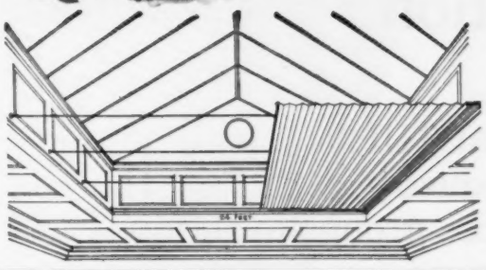

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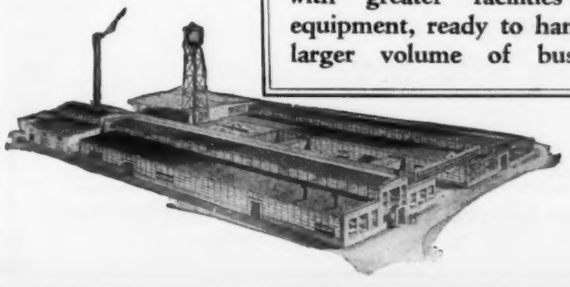

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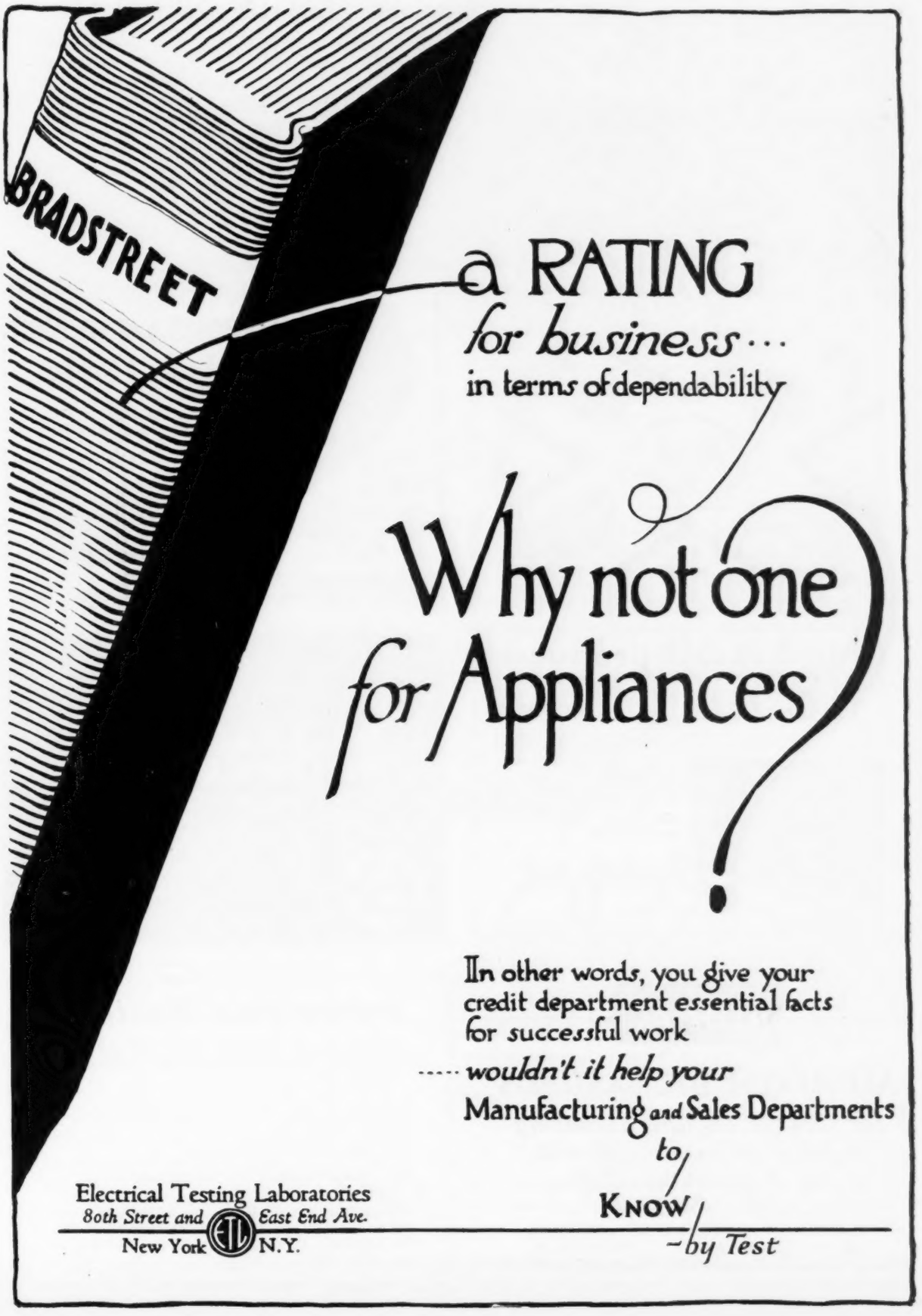
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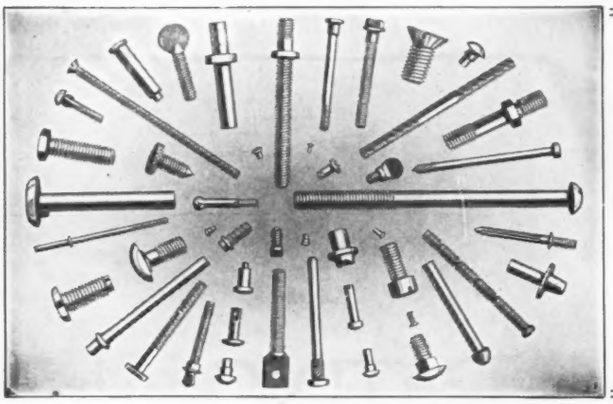

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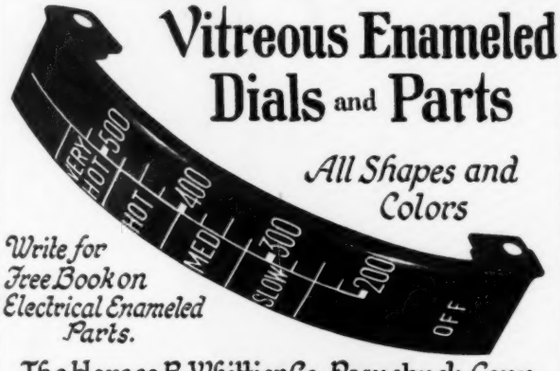

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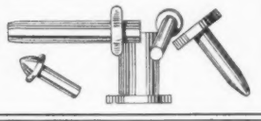

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"Blaisdell" Automatic Electric Cigar Lighter.
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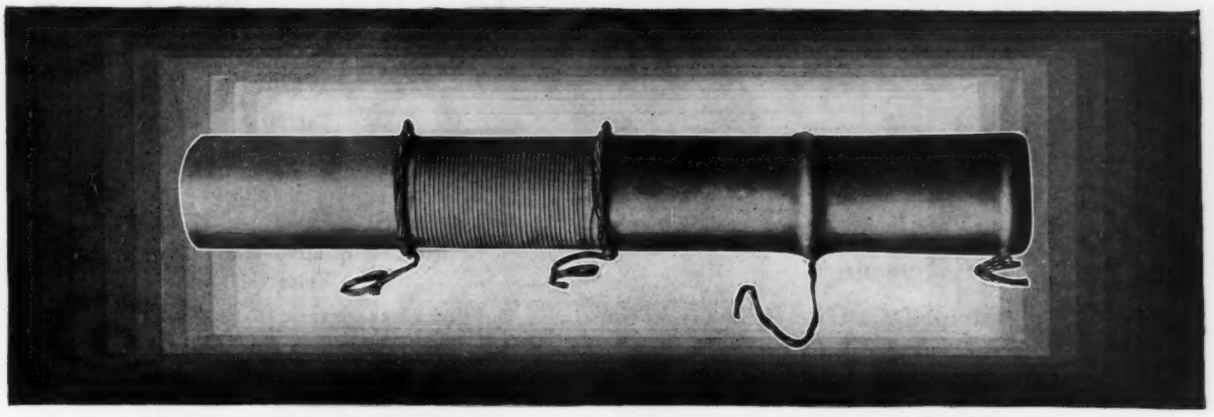
"Perkins" Siren.
"Aimco" Factory Horn.
"Arnold" Vapor Bath Cabinet.
"Wharton" Battery Charger.
"Flint" Waffle Iron.

Replies from our readers to any of these inquiries will be great appreciated by ELECTRICAL MANUFACTURING, Printing Crafts Bldg., 461 Eighth Ave., New York, N. Y.

VITROHM RESISTORS · · · IN EVERY INDUSTRY · · · IN EVERY LAND



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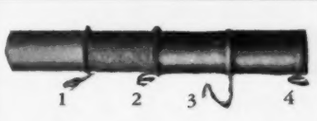

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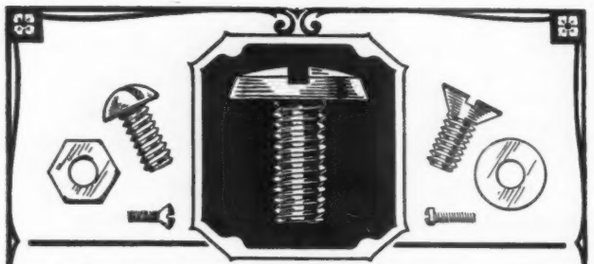

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"Arnold" Vapor Bath Cabinet
"Wharton" Battery Charger.
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Replies from our readers to any of these inquiries will be greatly appreciated by ELECTRICAL MANUFACTURING, Printing Crafts Bldg., 461 Eighth Ave., New York, N. Y.

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Send for free samples today!

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Try them in your own shop!

Shakeproof Lock Washer Company

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Send for free shop test samples

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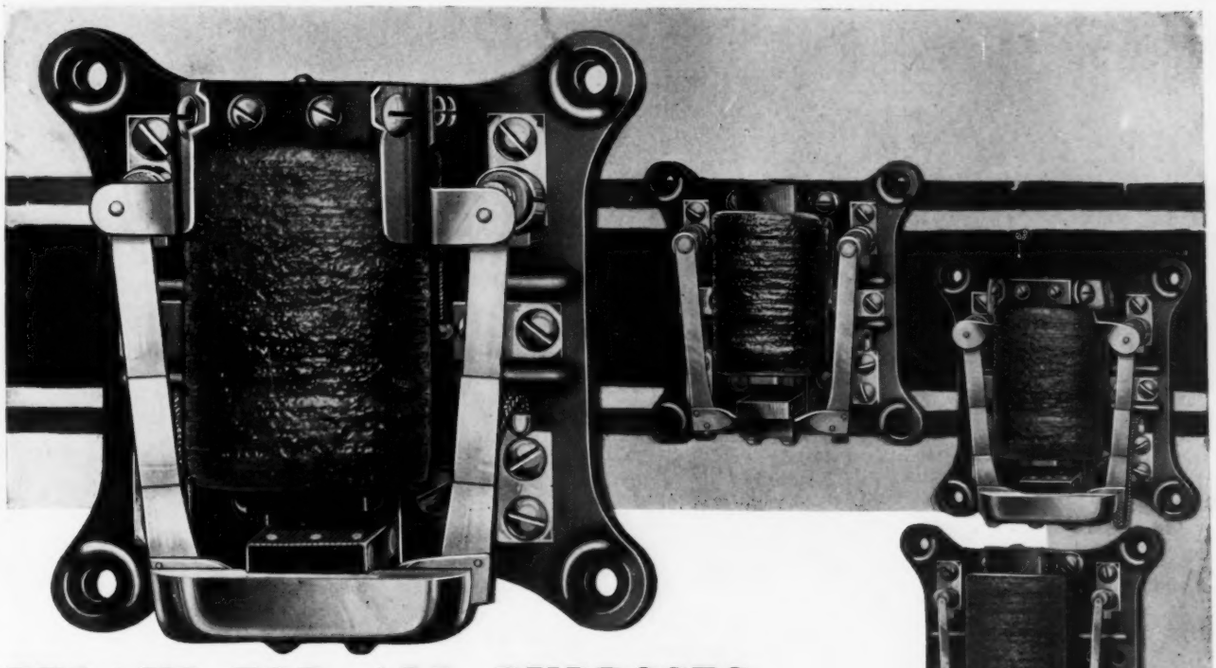

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